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ABSTRACT

These self-paced inservice modules are designed to help part-time vocational instructors learn how to teach. Addressed in the individual modules are the following topics: teaching methods (an overview of teaching, the lecture and discussion method, and the demonstration method); course construction (an overview of course construction and development of course outlines); use of lesson planning (an overview of lesson planning, development of instructor lesson plans, and development of student lesson plans); and procedures for testing and evaluation (an overview of testing and evaluation, procedures to test for knowledge and theories, ways of testing for skills development, and methods of scoring and grading). Each module comprises a series of lessons containing some or all of the following: a statement of purpose, objectives, instructional text, practical application activities, a self-test, and a key to the self-test. (MN)

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LEARNING HOW TO TEACH

Self-Paced Inservice Modules For Part-Time Vocational Instructors

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Introduction

Many vocational instructors, especially part-time instructors, are hired because of their solid work experience in certain occupational areas. Expertise in a particular occupation, however, does not guarantee equal talent in teaching that occupation. Teaching, like welding, auto mechanics, dental assisting, or any other occupation, requires both knowledge and skills that must be learned initially and developed continuously.

If you are one of the people who lack teaching experience, the four modules in this book have been designed for you. They will assist you in understanding effective teaching methodology and will help you become proficient in course construction, lesson planning, and testing and evaluation. Although there are many different techniques that could be presented, the modules include only those that are recognized as most effective by the profession.

Each learning module makes use of an individualized, self-paced delivery system. Modules are divided into units, which consist of several components designed to allow for independent study. These components are: (1) a statement of purpose, (2) a set of objectives, which describes what is supposed to be learned in the unit, (3) presentation of the informative material for the unit, (4) practical application activities for reinforcing learning, and (5) a self-test, to allow you to measure your learning. Keys to all the self-tests are contained in the appendices so that you may check your work, before going on to the next unit.

The best learning situtation is one in which there is maximum interaction between the teacher and student and among fellow students. However, since the schedules of vocational instructors—and particularly part-time instructors—do not always allow them the opportunity to participate in traditional in-service activities, these modules use an independent, individualized, self-paced approach. To help offset the lack of classroom interaction, you are encouraged to discuss your work with your colleagues, solicit advice from professionals in the field and request assistance in completing activities.

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LEARNING HOW TO TEACH

Teaching Methods

UNIT 1

An Overview of Teaching

STATEMENT OF PURPOSE

The purpose of this unit is to help develop an understanding of what teaching actually is. This is critical if in later units you are to learn how to go about teaching. Topics covered in this unit include: a definition of teaching, principles of learning, and the teaching steps.

OBJECTIVE

Upon completion of this unit you will be able to:

1. Define the term "teaching."
2. List several important principles of learning.
3. Explain each of the four traditional teaching steps.

PRESENTATION OF MATERIAL

What is teaching?

Many definitions of teaching exist, some simple and some complex, but probably the best relate teaching to learning. Facilitating learning is the purpose of teaching. Therefore, teaching can be defined very simply as helping students learn. Though this definition is a simple one, the processes involved are not. They will require you to study them, to apply them and to evaluate them, both initially and over time during your career as a teacher. Teaching itself is a continuous process.

Because the outcome of good teaching is learning, a first step in learning how to teach is to look at how people learn. Study the following principles of learning.

AN OVERVIEW OF TEACHING

Principles of learning

1. People learn best when they are ready to learn. This means that people who have a definite reason for learning or who see the utility of what is being taught are more apt to be receptive to learning. What this means to you as a vocational instructor is that teaching requires more than just presenting information. Students must be helped to see the utility and relevance of the learning. When they do, they will be more apt to take an active role in the learning process.

2. People learn more easily when what they are learning can be built on or related to something they already know. Thus, when planning your instruction, relate the new to the old. Start with something that is familiar to the students and build up to the new information or skills.

3. People must learn step-by-step. Instruction must be logically organized and must move from the concrete to the abstract or from the known to the unknown. Students learn best when they know where they have been, where they are now, where they are going, and how they are going to get there.

4. People learn by doing. Telling alone is not teaching. You can tell students how to do something, then show them how to do it, but until they have actually tried to do it themselves, no real learning has taken place. For example, you might tell a child how to ride a bike and then demonstrate how to ride the bike. However, until the child actually tries to ride, falls down, tries again, and finally conquers the challenge, the child has not learned.

5. The more often people use what they have learned, the better they will be able to understand it or perform it. This means that constant reinforcement of learning through practical application activities is a must if learning is to take place.

6. When a person experiences success in learning, it stimulates additional learning. This means presenting instruction to students in small enough doses that they are able to succeed. With time, experience and growth their doses can be increased. The key is to give them doses that are large enough to be challenging, but small enough to allow for success.

7. People need immediate feedback to know whether or not they have actually learned. This principle requires teachers to evaluate student learning frequently and to provide students with information about the results promptly.

The Teaching Steps

One of the most successful teaching methodologies is far from innovative, new or gimmicky. In fact, it is quite old and quite traditional. In spite of this, it has one redeeming quality—it works! This method uses four tried and proven steps that will help any vocational instructor to be successful in teaching: preparation, presentation, application and evaluation.

1. **Preparation**

   In this step you take care of all the details and arrangements necessary to ensure successful teaching and learning of a lesson. This involves preparing yourself, preparing the shop or classroom and preparing the students.

2. **Presentation**

   In this step you actually present the material you have prepared in the first step. A number of different methods can be used for presenting instruction. The two most common methods, lecture/discussion and demonstration, are the subjects of the next two units of this module.

3. **Application**

   In this step you give students an opportunity to apply what they are learning. This is a critical step. In fact, many veteran teachers believe that in vocational education, this is the most important step. No real learning takes place until students apply the various principles and theories they have been studying. For example, if a student is studying gas welding, application would be to require him/her to actually perform several gas welding tasks. If a student is studying auto mechanics, application would involve performing a tune-up or brake job or any other type of hands-on task.

4. **Evaluation**

   This is the step in which the student and the teacher determine how much learning has taken place. There are a number of different evaluation techniques such as objective testing, practical testing, observation, and a combination of all of these. The important thing to remember, regardless of the evaluation methodology used, is to provide feedback in as short an amount of time as possible. Immediate feedback is desirable.

PRACTICAL APPLICATION ACTIVITIES

1. Make a list of the principles of learning, leaving 10 or more lines between each principle. Under each principle, try to list those things that you do as an instructor to heed the principle. Once this part of the activity is completed, make a list of additional things you might do to ensure that each principle of learning is considered in the preparation, presentation, application and evaluation steps of your instruction.

2. Select a lesson from one of your courses. Make a list of those things that you have traditionally done in preparing, presenting, applying and evaluating the instruction for your lesson. Now make a new list of those things which you might consider doing in the future in each of the four steps to improve your instruction.

SELF-TEST FOR UNIT 1

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check you answers by turning to the key in the appendix. Reread the material covering any question you miss and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. In as few words as possible, define the term "teaching."

2. Why is it important for you as a vocational instructor to spend time helping your students understand why they are studying a particular lesson and how their learning for that lesson might be applied later?

3. Why is it important to present instruction in an orderly, organized manner?

4. Why should you begin with something that is familiar to the students?

SELF-TEST FOR UNIT 1
Continued

5. Why is it important to present instruction in small enough blocks to ensure that most students will be able to succeed?

6. There are four traditional teaching steps. List each step and provide a brief explanation of what the teacher does in each. (Use back side of sheet if necessary.)

UNIT 2

The Lecture/Discussion Method

STATEMENT OF PURPOSE

The purpose of this unit is to help you learn to make effective use of the lecture/discussion method. Topics covered include: what the lecture/discussion method is, why it is used, when and when not to use it, how to prepare students for the lecture/discussion session and the components of the lecture/discussion method (opening, body and closing).

OBJECTIVES

Upon completion of this unit you will be able to:

1. Explain what the lecture/discussion method is, why it is used, when it is used and when it is not used.
2. Explain how to prepare students for a lecture/discussion session.
3. Develop an opening, body and conclusion of a lecture and present the lecture according to the specifics set forth in this unit.

PRESENTATION OF MATERIAL

What is the lecture/discussion method?

The lecture/discussion method of teaching is the oldest, most familiar, most used, and probably most abused, teaching method used. A lecture is a planned, structured and frequently illustrated (slides, charts, chalkboards, etc.) method of communicating information to a group of people. By itself, the lecture allows for only one-way communication. This serious deficiency is overcome by adding the discussion component. Discussion can be between the instructor and students or among fellow students. During discussion, the instructor's job is to keep the discussion "on-track" and moving in the right direction.

THE LECTURE/DISCUSSION METHOD

Why is the lecture/discussion method used?

The best justification for using the lecture/discussion method is that it is an effective way to communicate information to groups that are too large to allow for individual interaction between instructor and students. Another reason for using this method is that it allows the instructor to generate enthusiasm among students about a topic.

When and when not to use the lecture/discussion method

The lecture/discussion method, if used properly, can be an effective teaching method. However, it does not work in every situation. As a vocational teacher you need to know when to use it and when to use another method.

Use the lecture/discussion method when:

1. The material to be presented deals strictly with data, theory or information (no skills development).
2. Students need to be motivated before beginning a particular lesson.
3. The material to be presented is not available in print.
4. Sharing insight or experience in a particular area will enhance learning.
5. It is necessary to communicate information to a large group in one session.
6. Interaction among students is desired.

Do not use the lecture/discussion method when:

1. The subject matter deals with skills development or "how-to" information.
2. The student group is small enough to allow for individual student-teacher interaction.
3. There is no need for interaction among students.

Preparing students for the lecture/discussion session

This is probably the most overlooked, underused step. Students must be thoroughly prepared prior to the session. If they are not, the session will be all lecture and no discussion.

THE LECTURE/DISCUSSION METHOD

Require students to approach a lecture/discussion session on a topic as if they were entering into a debate on a topic. This will ensure that they are active, contributing participants rather than passive spectators.

Prepare students for a lecture/discussion session as follows:

1. Give students a written outline or overview of the lecture.

2. Have students use the outlines as a study guide or a guide to research and reading. Students should take thorough notes while researching the topics on the outline.

3. While reading and/or researching, students should make note of anything that is unclear to them or about which they cannot locate information.

4. Have students put their notes together in an annotated outline, leaving plenty of blank space for taking notes under each item during the lecture/discussion session.

The lecture/discussion (opening, body and closing)

There is a saying in teaching, that goes: "When giving a lecture, tell them what you are going to tell them, then tell them, then tell them what you told them." Although it is said with tongue in cheek, this is actually good advice. A well planned, properly structured lecture contains three distinct components: the opening, in which you "tell them waht you are going to tell them"; the body, in which you tell them; and the closing, in which you "tell them what you told them."

Discussion may be interspersed within the body or held off until after the closing, depending on your preference. The recommended method is to allow discussion during the body of the lecture while questions and concerns are fresh on the students' minds.

The opening, body and closing of a lecture all contain specific tasks that should be accomplished in order:

1. Opening

   a. Greet the class.
   b. State the title of the lecture.
   c. Explain the purpose of the lecture.
   d. List the objectives so that students know exactly what they should be learning.
   e. Explain how the current lecture/discussion session relates past topics studied.

   f. List and define any new terms which will be used during the session.
   g. Present a general overview of the content of the lecture/discussion.

2. Body

   a. Present the information in the order set forth on the students' outline.
   b. Initiate discussion by raising specific questions, calling on students for comments and/or soliciting questions from the students.
   c. Make frequent reference to all visual aids and supportive materials.

3. Closing

   a. Restate the title, purpose and objectives.
   b. Briefly summarize major points.
   c. State your conclusions.
   d. Answer remaining questions.
   e. Make follow-up assignments to reinforce the lecture/discussion.

The elements listed above are the fundamental or tangible tasks that should be performed in all lecture/discussion sessions. You should also keep in mind a number of intangibles when conducting lecture/discussion sessions:

1. Prior to beginning, make sure that the classroom is arranged to accommodate a lecture/discussion.

2. Be enthusiastic. Enthusiasm is contagious.

3. Call on students by name. They will appreciate the recognition and feel more at ease.

4. Spread your attention around evenly. This will make all students feel like they are part of the lecture/discussion.

5. Maintain eye contact with all students in the session.

6. Speak clearly, evenly and slowly enough to be understood, but not in a monotone.

7. Use facial expressions, body language and movement to emphasize points.

8. It is alright to use an outline or note cards to keep yourself on track, but never read a lecture to the students.

9. Use carefully prepared visual aids to reinforce major points.

10. Do not dominate—facilitate. Student participation is critical. Remember, this method is called lecture/discussion.

PRACTICAL APPLICATION ACTIVITIES

1. Select a lesson that you currently teach or plan to teach. Prepare a lecture for this lesson, making a comprehensive outline of the material for the opening, body and closing.

2. Develop a list of questions that you can use to encourage discussion during the body of the lecture.

3. Practice the lecture several times until you can present the material with only occasional brief glaces at your notes. Practice the hand gestures, facial expressions, body language and eye movement you will employ in presenting the lecture and directing the discussion.

4. Present the lecture/discussion to your class.

SELF-TEST FOR UNIT 2

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the key in the appendix. Reread the material covering any question that you answer incorrectly and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. What is the lecture/discussion method of teaching?

2. Give two justifications for using the lecture/discussion method.

3. Give two occasions when the lecture/discussion method is one of the most appropriate teaching methods available.

4. Give two occasions when the lecture/discussion method is not appropriate.

SELF-TEST FOR UNIT 2
Continued

5. List in order seven specific tasks performed in the opening section of a lecture.

6. Name the three tasks performed in the body of a lecture.

7. List in order the five tasks performed in the closing section of a lecture.

UNIT 3

The Demonstration Method

STATEMENT OF PURPOSE

The purpose of this unit is to help participants develop skills in using the demonstration method of teaching. Topic covered in this unit include: preparing the demonstration, giving the demonstration and following up the demonstration.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Explain the steps involved in preparing a demonstration.
2. Explain how to properly present a demonstration.
3. Explain how to follow up a demonstration.
4. Prepare, present and follow up a demonstration.

PRESENTATION OF MATERIAL

Preparing the demonstration

Demonstration is the process in which the instructor shows students how to perform certain skills tasks. While demonstrating, the instructor also explains all operations in a step-by-step progression. The key to giving a good demonstration is preparation. The following checklist contains specific tasks necessary to preparing for a demonstration:

1. Decide exactly what the purpose of the demonstration is, why it will be given, what students should get out of it, what will be demonstrated and in what order, and how long the demonstration will last.

2. Gather all tools, equipment and instructional aids and make sure that everything required is available and in working order. Never put yourself in a position of being forced to stop a demonstration unexpectedly because something does not work the way it should or because a necessary part of the demonstration is not on hand.

3. Set up the demonstration so that students will be able to easily see what is going on and hear what you are saying.

4. Arrange all materials to be used in the demonstration so that they correspond with the order in which the various steps of the demonstration will be presented.

5. Practice the demonstration several times before giving it so that any "bugs" can be worked out of it.

Give the demonstration

Just as there are specific tasks to be performed in presenting a lecture, there are specific tasks to be performed in giving a demonstration. The following checklist contains specific tasks necessary in presenting a demonstration.

1. Orient students to the demonstration by explaining its purpose and objectives. Give them a brief overview of the content of the demonstration. Explain how the demonstration ties in with what the students already know.

2. Present the demonstration in a slow, deliberate fashion so that students can easily follow.

3. Pause between stages to determine if students are comprehending or to see if they have any questions that should be answered before continuing. Go back over any steps that students did not seem to grasp.

4. Conclude the demonstration with a brief summary and question/answer session.

Follow up the demonstration

Student activity in skills development is critical. Remember, no matter how well a demonstration is presented, it is really just showing. Showing is important, but students learn best by doing, so, it is vital to provide students with hands-on activities after a demonstration. An effective way to follow up demonstrations is to:

1. Select several students and ask them to repeat the demonstration you have just given.

2. Assign several practical application activities in which the students are required to apply the skills demonstrated.

3. Observe students on an individual basis as they attempt to perform the practical application activities. Give individual attention and assistance where needed. Be sure to correct misapplications immediately so that the wrong way does not become a habit.

4. Conduct performance evaluations so that student skills development can be measured.

PRACTICAL APPLICATION ACTIVITIES

1. Develop a checklist for use in preparing and giving a demonstration.

2. Select a skill area from a lesson that you teach or plan to teach. Plan a demonstration for that skill area.

3. Develop several practical application activities to assign at the conclusion of the demonstration.

4. Present the demonstration to your class and follow it up.

SELF-TEST FOR UNIT 3

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the key in the appendix. Reread the material covering any questions you miss and do not proceed to the next module until you can correctly answer all items on the self-test.

1. List the five specific steps to be followed in preparing a demonstration.

2. List the four rules to remember when presenting a demonstration.

3. List four steps to apply in following up a demonstration.

APPENDIX

APPENDIX A

Key to Unit 1 Self-Test

1. Helping students learn.

2. Because people learn best when they understand the reason for the learning.

3. Because people learn best by doing.

4. Because people learn step-by-step in logical progression from the known to the unknown.

5. Because success in learning stimulates additional learning.

6. a. Preparation - Instructor prepares himself/herself, the shop or classroom and the students in order to ensure successful teaching and learning.

   b. Presentation - Instructor actually presents the material for a lesson. Two methods commonly used are the lecture/discussion method and the demonstration method.

   c. Application - Instructor provides the students with practical application activities so that they can learn by doing.

   d. Evaluation - Instructor conducts written or performance evaluations to measure learning and/or skills development.

APPENDIX B

Key to Unit 2 Self-Test

1. It is a planned, structured method of presenting information to groups of students and allowing them to discuss the information and its applications.

2. a. It is effective for communicating information to groups that are too large to allow for individual interaction between instructor and students.

   b. It allows the teacher to generate enthusiasm for a particular lesson.

3. Two of the following:

   a. When the material to be presented is strictly data, theory or information.

   b. When the students need to be motivated.

   c. When the material to be presented does not appear in print.

   d. When it is necessary to communicate information to a large group in one session.

   e. When student interaction is desirable.

4. Two of the following:

   a. When the subject matter deals with skills development or "how-to" information.

   b. When the student group is small enough to allow for individual student-teacher interaction.

   c. When there is no need for interaction among the students.

5. a. Greet the class.
   b. State the title of the lecture.
   c. Explain the purpose of the lecture.
   d. List the objectives of the lecture.
   e. Relate current lecture to past learning.
   f. Define new terms.
   g. Present an overview of the lecture.

6. a. Present the information.
   b. Initiate discussion among students.
   c. Make frequent reference to visual aids.

7. a. Restate the title, purpose and objectives.
   b. Summarize major points.
   c. State conclusions.
   d. Answer remaining questions.
   e. Make follow-up assignments.

APPENDIX C

Key to Unit 3 Self-Test

1. a. Decide upon the purpose of and length of the demonstration.
   b. Gather all necessary materials and make sure that they are in working order.
   c. Set up so that all students will be able to see and hear.
   d. Arrange all materials to correspond with the order of presentation.
   e. Practice several times.

2. a. Explain the purpose and objectives of the demonstration.
   b. Present the demonstration in a slow, deliberate fashion.
   c. Check to see if students understand and repeat if necessary.
   d. Conclude with a summary and question/answer session.

3. a. Have several students repeat the demonstration.
   b. Assign several practical application activities.
   c. Observe students on an individual basis and give assistance where needed.
   d. Conduct performance evaluations.

LEARNING HOW TO TEACH

Course Construction

UNIT 1

An Overview of Course Construction

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop an overall understanding of course construction as a process. Topics covered include: What a course is, what a course outline is and what the steps are in course construction.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Define the following terms: curriculum, school curriculum, program curriculum and course.
2. Explain the purpose, uses and applications of a course outline.
3. Explain the various steps in course construction.

PRESENTATION OF MATERIAL

What is a course?

Before you can understand what a course is, you must first understand the term "curriculum." Curriculum is a broad concept, of which a course is an essential building block. Curriculum is defined as all of the planned experiences provided for students under the direction of the school. This includes activities designed to help students grow in terms of knowledge, skills, attitudes and personality. A school sponsored service club that seeks to develop leadership skills in students is just as much a part of the curriculum as an activity designed to develop occupational skills.

AN OVERVIEW OF COURSE CONSTRUCTION

A vocational school has a curriculum, known as the school curriculum, which consists of the sum of all planned experiences provided for students by the school. In turn, each individual program within a vocational school has a curriculum known as the program curriculum (for instance, the drafting program curriculum or the welding program curriculum). Vocational program curriculums are made up of courses. Following is an example of a program curriculum for a one-year auto body repair program. Each individual entry is a course:

Auto Body Repair Curriculum

Shop Safety
Body Repair 1
Body Repair 2
Refinishing 1
Refinishing 2
Repair Cost Estimation
Technical Math
Technical Report Writing

Course can now be defined as the plan for one well defined part of a program curriculum designed to facilitate a specific set of learning goals. Courses may be scheduled so that students complete them within a certain prescribed time, such as one semester or one six-week period, or they may presented in a competency-based, self-paced format. In either case, courses are the primary building blocks of vocational program curriculums.

What is a course outline?

A course outline is your master plan, or "blueprint," for presenting a course. Every course should have a comprehensive course outline. It contains: a statement of purpose that explains the overall objectives of the course and where it fits into the program curriculum; a list of broad instructional goals for the course that convey its scope and sequence; an explanation of the recommended instructional delivery system; an explanation of the recommended evaluation methodology; an explanation of the grading system; and a list of resources such as required textbooks, expendable supplies, teaching aids and tools needed.

A good course outline will provide you with a comprehensive set of guidelines for doing the more detailed week-to-week and day-to-day planning for a course.

If you are teaching a course for the first time you would use the course outline as a guide in developing individual lesson plans. Some well organized teachers develop course outlines in such a way that each instructional goal in the outline becomes the major goal of one individual lesson plan, which is then translated into more specific learning objectives.

What are the steps in course construction?

Course construction is a systematic, step-by-step planning process. It is important that all steps be followed and that they be performed in the proper order. The steps are:

1. Develop a general outline of topics to be covered in the course.

   This is referred to as a "scope and sequence" outline. There are a number of resources you can call upon in developing such an outline. One method is to obtain several different textbooks that might be used in teaching the subject and use their contents as a point of beginning. Convene a meeting of experts on the course subject matter from industry and education to examine the rough draft of the scope and sequence outline and determine what should be added and what should be deleted. The resulting outline is used as a tool in developing the actual course outline.

2. Write a statement of purpose.

   The first component in the course outline is the statement of purpose. This is a brief statement explaining the overall purpose of the course and where it fits into the curriculum.

3. Write the course goals.

   The scope and sequence outline developed in the first step lists the various topics to be covered in the course. Just listing topics, however, is no longer acceptable in modern vocational education programs. Rather, it is important to list what the student will actually learn. For inclusion in the course outline, topics are converted into instructional goals. The list of goals serves as the scope and sequence outline for the course.

4. Explain the instructional delivery system.

   There are many different instructional methodologies that can be used in presenting instruction. Lectures, demonstrations, computer assisted instruction and competency-based learning are some of the more common. The explanation of the instructional delivery system tells which methods are used for various aspects of the course and gives examples.

5. Explain the evaluation methodology.

   Several different methods can be used for measuring the learning, development and progress of students. Objective written tests, proficiency examinations and graded skills projects are among the most effective. The evaluation statement explains what method or methods are recommended for the course.

6. Explain the grading system.

   Several different methods can be used for scoring written tests, proficiency examinations and skills projects and then converting the numerical scores to letter grades. The grading system statement explains scoring methods, grade scales and what percentage of the final grade is derived from tests, projects, attendance and so forth.

7. List resources required.

   In planning instruction, it is helpful to have a list of the various textbooks, reference books, materials, tools and supplies needed by instructors and students. Examine the course goals to determine what support materials are required and list them in the course outline.

PRACTICAL APPLICATION ACTIVITIES

1. Obtain a course outline from an instructor on the faculty where you teach. Examine it closely and ask yourself these questions about the outline:

   a. Does it have a statement of purpose? If so, what information does the statement contain?

   b. Does it contain a list of course goals? If so, are they stated in a form that explains what will be learned?

   c. What types of delivery systems are recommended for use in the course?

   d. What is the grade scale used for converting numerical scores into letter grades?

   e. What is the title of the textbook used in the course?

2. Make a list of pertinent questions not addressed in the course outline that you would ask if you were called on to teach this course.

SELF-TEST FOR UNIT 1

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portion of the text covering any material you missed and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. Define the following terms:

   a. Curriculum -

   b. School curriculum -

   c. Program curriculum -

   d. Course -

   e. Course outline -

2. What are the components of a course outline?

SELF-TEST FOR UNIT 1
Continued

3. Explain the importance of the difference between a topic to be covered and a course goal.

UNIT 2

Developing Course Outlines

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop skills in constructing course outlines. Topics covered include: writing a statement of purpose, writing course goals, explaining the instructional delivery system, explaining the evaluation methodology, explaining the grading system and listing required resources.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Write a statement of purpose.
2. Write a set of goals.
3. Write an instructional delivery system statement.
4. Write an evaluation methodology.
5. Write a grading system statement.
6. Develop a resource list.
7. Combine items 1 through 6 above in a comprehensive course outline.

A sample course outline, for a computer aided drafting course, appears in Appendix A.

PRESENTATION OF MATERIAL

The statement of purpose contains two items of information: (1) an explanation of the overall purpose of the course and (2) an explanation of where the course fits into the program curriculum. Following is a sample statement of purpose for a machining course:

Statement of Purpose

Machining 1 is the first in a series of 10 courses that make up the machining program curriculum. The purpose of this course is to help students develop all of the fundamental knowledge, skills and attitudes necessary to be successful in studying the advanced courses which follow. Student learning will include: safe shop practices, working in teams, basic machining operations, blueprint reading and machining math.

Writing the course goals

Course goals are instructional goals that explain in broad terms what students will learn in the course. They are developed from the topics listed in the scope and sequence outline which is prepared as a preliminary step to working on the course outline (see Unit 1). Course goals should be stated in terms that explain what students will learn, not what subject matter will be covered. The goals then serve as the scope and sequence outline for the course.

Following are a preliminary scope and sequence outline for a basic drafting course and a partial set of course goals developed from it:

Preliminary Scope and Sequence Outline

1. Lettering, linework and scale use
2. Dimensioning practices
3. Orthographic projection
4. Sectioning
5. Auxiliary views
6. Isometric drawing
7. Oblique drawing
8. Perspective drawing

Course Goals

Upon completion of this course students will be able to:

1. Demonstrate proficiency in all types of freehand lettering including upper-case, lower-case, vertical, inclined block and architectural.

2. Demonstrate proficiency in constructing the various types of lines used in drafting including: object, hidden, dimension, extension, leader, sectioning, cutting plane and phantom lines.

3. Demonstrate proficiency in the use of the architect's, engineer's and metric scales.

4. Demonstrate proficiency in developing orthographic projections and converting them into finished multiview drawings.

5. Demonstrate proficiency in cutting sections and then drawing removed, revolved and broken out sections.

Explaining the instructional delivery system

There are numerous instructional delivery systems that can be used in teaching vocational courses. Lectures, demonstrations, computer assisted instruction and competency-based learning are some of the more frequently used and most effective methods. The statement in the course outline simply explains the recommended delivery system. Following is an example of a delivery system statement for a basic electronics course:

> Instructional Delivery System
>
> The preparation-lecture-demonstration-application-evaluation instructional delivery system is recommended for this course. In the preparation phase, students are prepared for the lecture by being required to read, watch audio-visual presentations, or conduct research into the topic in question. The instructor then presents a lecture covering all theories, principles and concepts relating to the topic in question. This is followed up with demonstrations covering the various skills that will be developed. Students are then given practical application activities such as experiments and trouble shooting projects. Once all activities and projects have been completed, students are tested before proceeding.

Explaining the evaluation methodology

There are many ways to measure learning, development and progress in vocational courses, including objective written tests, proficiency examinations and skills projects. A course outline should contain a statement explaining the recommended methods to be used in conducting evaluations and approximately when or how often the methods will be used. Following is an example of an evaluation statement for a basic drafting course:

Evaluation System

Written objective tests, grading skills projects and proficiency examinations are the recommended methods for conducting evaluations in this course. Principles, theories and terminology are to be tested using objective written instruments at least once each week. Assigned skills projects or drawings are graded on a daily basis. Proficiency examinations that require students to apply theories, principles, terminology and skills should be administered at mid-term and at the conclusion of the term.

Explaining the grading system

How student evaluations will be scored and how scores will be converted to letter grades are explained in a grading system statement. It should contain the following information:

1. Explanation of how written tests are scored.
2. Explanation of how skills projects and proficiency examinations are scored.
3. Explanation of how numerical scores are converted to letter grades.
4. A percentage breakdown for computing the final grade.

Following is an example of a grading system statement that might be used for a drafting class:

The Grading System

Written tests are scored as a percentage of correct responses. The percentage is computed by forming a ratio of the number of correct responses to the total number of correct responses possible (for example, a student responds correctly to 56 out of a possible 75 correct answers or 56/75 = .746 or 75% rounded off).

Skills projects and proficiency exams are scored using specific criteria accompanied by rating scales. Scores are expressed as percentages and are arrived at by forming a ratio of actual performance to expected performance. For example:

Criteria	Scale
Constructs proper solution	1 2 3 **4** 5
Correctly dimensioned	1 2 **3** 4 5
Correctly annotated	1 2 3 **4** 5
Accuracy	1 2 3 **4** 5
Neatness	1 2 **3** 4 5

In this example, the student scored 18 points out of a possible 25 for a score of 18/25 = .72 or 72%.

The following grading scale will be used for converting numerical scores into letter grades:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

Final grades are computed according to the following percentages:

Average of all test scores	25%
Average of all skills projects	25%
Average of all proficiency exams	30%
Instructor's subjective judgment in such areas as attitude, work habits, attendance, personability and attention to safety rules	20%
	100%

Listing resources needed

Course outlines should contain a list of all materials that will be needed by you and the students in order to complete the course. These materials include: required textbooks, reference books, expendable supplies, tools and teaching aids. Following is an example of a resource list for a basic drafting course:

Resource List

Required textbook	Fundamentals of Drafting, 3rd edition, by David J. Smith, Delmar Publishers, Inc., 1983.
Recommended references	American National Standard Institute (ANSI) Y14.5
	"Drafting as a Career," a brochure by the American Institute for Design and Drafting (AIDD)
Tools/Supplies	Standard set of drafting tools 100% rag drafting vellum ;30

sheets per student)
3 mil polyester film (15 sheets per student)
Ammonia developing print paper (45 sheets per student)

Teaching Aids.....Overhead projector
16mm film projector
35mm slide projector
Portable flip chart and markers

PRACTICAL APPLICATION ACTIVITIES

1. Select a course in your occupational area and prepare a complete course outline for it.

2. Distribute copies of your finished product to several fellow instructors and ask for their criticism. Review their comments and revise your outline in keeping with valid suggestions.

SELF-TEST FOR UNIT 2

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portion of the text covering any material you miss and do not proceed to the next module until you can correctly answer all items on the self-test.

1. What two items of information are included in the statement of purpose for a course?

2. Compile several topics to be covered in your occupational area and state them as course goals.

SELF-TEST FOR UNIT 2
Continued

3. What is an instructional delivery system?

4. What is an evaluation methodology?

5. What four items of information should the grading system statement include?

APPENDIX A

Sample Course Outline

Statement of Purpose

Computer Aided Drafting is the last of 10 courses leading to an occupational certificate in drafting and design. The purpose of this course is to help students develop all of the fundamental knowledge, skills and attitudes required to be job entry-level qualified as computer aided drafting technician trainees.

Course Goals

Upon completion of this course, students will be able to do the following:

1. Define the term "computer aided drafting."
2. List the components in a typical computer aided drafting hardware configuration.
3. Explain the basic operations of computer aided drafting: input, processing and output.
4. Demonstrate proficiency in the use of Cartesian coordinate systems.
5. Explain special characteristics of computer aided drafting including: accuracy, repeatability, resolution, speed and storage.
6. Explain the various types of hardware, software and users associated with computer aided drafting.
7. Demonstrate proficiency in performing computer aided drafting tasks including: digitizing, menu use, keyboard use, plotting, printing, editing, hardcopying, lettering, linework, scaling, dimensioning, rotating, zooming, mirroring and lavering.

Instructional Delivery System

The preparation-lecture-demonstration-application-evaluation instructional delivery system is recommended for this course. To begin each lesson, students should be required to read pertinent literature in their textbooks and from the library. The instructor then presents a heavily illustrated lecture explaining and reinforcing the reading material. Lectures are followed by skills development demonstrations when appropriate and then students are assigned application activities. These are followed by evaluations that include both written tests and proficiency exams.

APPENDIX

Sample Course Outline

Evaluation System

Objective written tests and proficiency examinations are the recommended evaluation methods for this course. Principles, theories, concepts and terminology are tested using objective written instruments at least once each week. Proficiency examinations requiring students to apply theories, concepts, principles, terminology and skills should be administered at least once every two weeks.

Grading Systems

Written tests are scored by forming a ratio of correct responses to possible correct responses (for example, a student who correctly answers 75 out of 100 questions would score 75/100 = .75 or 75%).

Proficiency exams are scored by listing performance criteria and scoring student performance against each criteria from 1 (low) to 5 (high). The student's total score divided by the total possible score is the final score (for example, a student whose total for all criteria is 50 when the total possible score is 75, would score 50/75 = .666 or 67% rounded off).

The following grade scale is to be used for converting numerical scores to letter grades:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

Final grades are to be computed according to the following percentages:

Average test scores	40%
Average of all proficiency exams scores	40%
Attendance score	10%
Student attitude, work habits, personability, willingness to learn, attention to safety rules and stick-to-itiveness	10%
	100%

APPENDIX

Sample Course Outline
Continued

Resource List

Required Textbooks

1. Introduction to Computer Aided Drafting, by David L. Goetsch, Prentice-Hall Publishers, Inc., 1983.

2. The CAD/CAM Workbook, by David L. Goetsch, South-Western Publishers, Inc., 1983.

Recommended References

Any dictionary of computer terminology.

Tools and Supplies

Ink, extra pens, drafting vellum, polyester film and bond paper for the CAD system plotters.

Teaching Aids

Overhead transparency projector and screen.
35mm slide projector.

APPENDIX B

Key to Unit 1 Self-Test

1. Curriculum--All of the planned experiences offered students under the direction of the school.

   School curriculum--The sum of all the planned experiences offered under the direction of all the school's various vocational programs.

APPENDIX B

Key to Unit 1 Self-Test
Continued

Program curriculum--All of the planned experiences provided students under the specific direction of an individual vocational program.

Course--A plan for one well defined part of a program curriculum which is designed to facilitate the accomplishment of a particular set of learning goals.

Course outline--A master plan, or "blueprint," for presenting a course.

2. A course outline contains: a statement of purpose, a set of course goals, an instructional delivery system statement, an evaluation statement, a grading system statement and a resource list.

3. A course goal is written in a form that explains what the student will learn, rather than just what will be covered. The difference is that simply covering material is not enough. Students must learn what is covered.

APPENDIX C

Key to Unit 2 Self-Test

1. The overall purpose of the course and where it fits into the program curriculum.

2. Two examples are:

Topic to be covered: Arrangement of keys on a typewriter keyboard.

Corresponding learning goal: Students will learn to identify specific keys on an unmarked typewriter keyboard.

Topic to be covered--Family Budgeting.

Corresponding learning goal--Students will learn to develop and maintain a monthly family budget for a specified number of people based on a specific annual income.

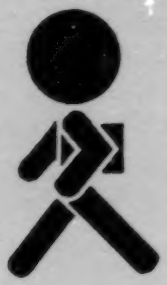
APPENDIX C

Key to Unit 2 Self-Test
Continued

3. A compilation of all the methods instructors use to present instruction and facilitate learning.

4. A compilation of all of the methods instructors use to measure learning, development and progress in vocational education.

5. An explanation of how written tests are scored.
   An explanation of how skills projects or proficiency examinations are scored.
   An explanation of how numerical scores are converted to letter grades.
   A percentage breakdown for computing final grades.



LEARNING HOW TO TEACH

Course Construction

UNIT 1

An Overview of Course Construction

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop an overall understanding of course construction as a process. Topics covered include: What a course is, what a course outline is and what the steps are in course construction.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Define the following terms: curriculum, school curriculum, program curriculum and course.
2. Explain the purpose, uses and applications of a course outline.
3. Explain the various steps in course construction.

PRESENTATION OF MATERIAL

What is a course?

Before you can understand what a course is, you must first understand the term "curriculum." Curriculum is a broad concept, of which a course is an essential building block. Curriculum is defined as all of the planned experiences provided for students under the direction of the school. This includes activities designed to help students grow in terms of knowledge, skills, attitudes and personality. A school sponsored service club that seeks to develop leadership skills in students is just as much a part of the curriculum as an activity designed to develop occupational skills.

AN OVERVIEW OF COURSE CONSTRUCTION

A vocational school has a curriculum, known as the school curriculum, which consists of the sum of all planned experiences provided for students by the school. In turn, each individual program within a vocational school has a curriculum known as the program curriculum (for instance, the drafting program curriculum or the welding program curriculum). Vocational program curriculums are made up of courses. Following is an example of a program curriculum for a one-year auto body repair program. Each individual entry is a course:

Auto Body Repair Curriculum

Shop Safety
Body Repair 1
Body Repair 2
Refinishing 1
Refinishing 2
Repair Cost Estimation
Technical Math
Technical Report Writing

Course can now be defined as the plan for one well defined part of a program curriculum designed to facilitate a specific set of learning goals. Courses may be scheduled so that students complete them within a certain prescribed time, such as one semester or one six-week period, or they may presented in a competency-based, self-paced format. In either case, courses are the primary building blocks of vocational program curriculums.

What is a course outline?

A course outline is your master plan, or "blueprint," for presenting a course. Every course should have a comprehensive course outline. It contains: a statement of purpose that explains the overall objectives of the course and where it fits into the program curriculum; a list of broad instructional goals for the course that convey its scope and sequence; an explanation of the recommended instructional delivery system; an explanation of the recommended evaluation methodology; an explanation of the grading system; and a list of resources such as required textbooks, expendable supplies, teaching aids and tools needed.

A good course outline will provide you with a comprehensive set of guidelines for doing the more detailed week-to-week and day-to-day planning for a course.

If you are teaching a course for the first time you would use the course outline as a guide in developing individual lesson plans. Some well organized teachers develop course outlines in such a way that each instructional goal in the outline becomes the major goal of one individual lesson plan, which is then translated into more specific learning objectives.

What are the steps in course construction?

Course construction is a systematic, step-by-step planning process. It is important that all steps be followed and that they be performed in the proper order. The steps are:

1. Develop a general outline of topics to be covered in the course.

   This is referred to as a "scope and sequence" outline. There are a number of resources you can call upon in developing such an outline. One method is to obtain several different textbooks that might be used in teaching the subject and use their contents as a point of beginning. Convene a meeting of experts on the course subject matter from industry and education to examine the rough draft of the scope and sequence outline and determine what should be added and what should be deleted. The resulting outline is used as a tool in developing the actual course outline.

2. Write a statement of purpose.

   The first component in the course outline is the statement of purpose. This is a brief statement explaining the overall purpose of the course and where it fits into the curriculum.

3. Write the course goals.

   The scope and sequence outline developed in the first step lists the various topics to be covered in the course. Just listing topics, however, is no longer acceptable in modern vocational education programs. Rather, it is important to list what the student will actually learn. For inclusion in the course outline, topics are converted into instructional goals. The list of goals serves as the scope and sequence outline for the course.

4. Explain the instructional delivery system.

   There are many different instructional methodologies that can be used in presenting instruction. Lectures, demonstrations, computer assisted instruction and competency-based learning are some of the more common. The explanation of the instructional delivery system tells which methods are used for various aspects of the course and gives examples.

5. Explain the evaluation methodology.

   Several different methods can be used for measuring the learning, development and progress of students. Objective written tests, proficiency examinations and graded skills projects are among the most effective. The evaluation statement explains what method or methods are recommended for the course.

6. Explain the grading system.

   Several different methods can be used for scoring written tests, proficiency examinations and skills projects and then converting the numerical scores to letter grades. The grading system statement explains scoring methods, grade scales and what percentage of the final grade is derived from tests, projects, attendance and so forth.

7. List resources required.

   In planning instruction, it is helpful to have a list of the various textbooks, reference books, materials, tools and supplies needed by instructors and students. Examine the course goals to determine what support materials are required and list them in the course outline.

PRACTICAL APPLICATION ACTIVITIES

1. Obtain a course outline from an instructor on the faculty where you teach. Examine it closely and ask yourself these questions about the outline:

   a. Does it have a statement of purpose? If so, what information does the statement contain?

   b. Does it contain a list of course goals? If so, are they stated in a form that explains what will be learned?

   c. What types of delivery systems are recommended for use in the course?

   d. What is the grade scale used for converting numerical scores into letter grades?

   e. What is the title of the textbook used in the course?

2. Make a list of pertinent questions not addressed in the course outline that you would ask if you were called on to teach this course.

SELF-TEST FOR UNIT 1

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portion of the text covering any material you missed and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. Define the following terms:

   a. Curriculum -

   b. School curriculum -

   c. Program curriculum -

   d. Course -

   e. Course outline -

2. What are the components of a course outline?

SELF-TEST FOR UNIT 1
Continued

3. Explain the importance of the difference between a topic to be covered and a course goal.

UNIT 2

Developing Course Outlines

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop skills in constructing course outlines. Topics covered include: writing a statement of purpose, writing course goals, explaining the instructional delivery system, explaining the evaluation methodology, explaining the grading system and listing required resources.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Write a statement of purpose.
2. Write a set of goals.
3. Write an instructional delivery system statement.
4. Write an evaluation methodology.
5. Write a grading system statement.
6. Develop a resource list.
7. Combine items 1 through 6 above in a comprehensive course outline.

A sample course outline, for a computer aided drafting course, appears in Appendix A.

PRESENTATION OF MATERIAL

The statement of purpose contains two items of information: (1) an explanation of the overall purpose of the course and (2) an explanation of where the course fits into the program curriculum. Following is a sample statement of purpose for a machining course:

Statement of Purpose

Machining 1 is the first in a series of 10 courses that make up the machining program curriculum. The purpose of this course is to help students develop all of the fundamental knowledge, skills and attitudes necessary to be successful in studying the advanced courses which follow. Student learning will include: safe shop practices, working in teams, basic machining operations, blueprint reading and machining math.

Writing the course goals

Course goals are instructional goals that explain in broad terms what students will learn in the course. They are developed from the topics listed in the scope and sequence outline which is prepared as a preliminary step to working on the course outline (see Unit 1). Course goals should be stated in terms that explain what students will learn, not what subject matter will be covered. The goals then serve as the scope and sequence outline for the course.

Following are a preliminary scope and sequence outline for a basic drafting course and a partial set of course goals developed from it:

Preliminary Scope and Sequence Outline

1. Lettering, linework and scale use
2. Dimensioning practices
3. Orthographic projection
4. Sectioning
5. Auxiliary views
6. Isometric drawing
7. Oblique drawing
8. Perspective drawing

Course Goals

Upon completion of this course students will be able to:

1. Demonstrate proficiency in all types of freehand lettering including upper-case, lower-case, vertical, inclined block and architectural.

2. Demonstrate proficiency in constructing the various types of lines used in drafting including: object, hidden, dimension, extension, leader, sectioning, cutting plane and phantom lines.

3. Demonstrate proficiency in the use of the architect's, engineer's and metric scales.

4. Demonstrate proficiency in developing orthographic projections and converting them into finished multiview drawings.

5. Demonstrate proficiency in cutting sections and then drawing removed, revolved and broken out sections.

Explaining the instructional delivery system

There are numerous instructional delivery systems that can be used in teaching vocational courses. Lectures, demonstrations, computer assisted instruction and competency-based learning are some of the more frequently used and most effective methods. The statement in the course outline simply explains the recommended delivery system. Following is an example of a delivery system statement for a basic electronics course:

> Instructional Delivery System
>
> The preparation-lecture-demonstration-application-evaluation instructional delivery system is recommended for this course. In the preparation phase, students are prepared for the lecture by being required to read, watch audio-visual presentations, or conduct research into the topic in question. The instructor then presents a lecture covering all theories, principles and concepts relating to the topic in question. This is followed up with demonstrations covering the various skills that will be developed. Students are then given practical application activities such as experiments and trouble shooting projects. Once all activities and projects have been completed, students are tested before proceeding.

Explaining the evaluation methodology

There are many ways to measure learning, development and progress in vocational courses, including objective written tests, proficiency examinations and skills projects. A course outline should contain a statement explaining the recommended methods to be used in conducting evaluations and approximately when or how often the methods will be used. Following is an example of an evaluation statement for a basic drafting course:

Evaluation System

Written objective tests, grading skills projects and proficiency examinations are the recommended methods for conducting evaluations in this course. Principles, theories and terminology are to be tested using objective written instruments at least once each week. Assigned skills projects or drawings are graded on a daily basis. Proficiency examinations that require students to apply theories, principles, terminology and skills should be administered at mid-term and at the conclusion of the term.

Explaining the grading system

How student evaluations will be scored and how scores will be converted to letter grades are explained in a grading system statement. It should contain the following information:

1. Explanation of how written tests are scored.
2. Explanation of how skills projects and proficiency examinations are scored.
3. Explanation of how numerical scores are converted to letter grades.
4. A percentage breakdown for computing the final grade.

Following is an example of a grading system statement that might be used for a drafting class:

The Grading System

Written tests are scored as a percentage of correct responses. The percentage is computed by forming a ratio of the number of correct responses to the total number of correct responses possible (for example, a student responds correctly to 56 out of a possible 75 correct answers or 56/75 = .746 or 75% rounded off).

Skills projects and proficiency exams are scored using specific criteria accompanied by rating scales. Scores are expressed as percentages and are arrived at by forming a ratio of actual performance to expected performance. For example:

Criteria	Scale
Constructs proper solution	1 2 3 **4** 5
Correctly dimensioned	1 2 **3** 4 5
Correctly annotated	1 2 3 **4** 5
Accuracy	1 2 3 **4** 5
Neatness	1 2 **3** 4 5

In this example, the student scored 18 points out of a possible 25 for a score of 18/25 = .72 or 72%.

The following grading scale will be used for converting numerical scores into letter grades:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

Final grades are computed according to the following percentages:

Average of all test scores.....25%

Average of all skills projects.....25%

Average of all proficiency exams.....30%

Instructor's subjective judgment in such areas as attitude, work habits, attendance, personability and attention to safety rules.....20%

100%

Listing resources needed

Course outlines should contain a list of all materials that will be needed by you and the students in order to complete the course. These materials include: required textbooks, reference books, expendable supplies, tools and teaching aids. Following is an example of a resource list for a basic drafting course:

Resource List

Required textbook.....Fundamentals of Drafting, 3rd edition, by David J. Smith, Delmar Publishers, Inc., 1983.

Recommended references.....American National Standard Institute (ANSI) Y14.5

"Drafting as a Career," a brochure by the American Institute for Design and Drafting (AIDD)

Tools/Supplies.....Standard set of drafting tools
100% rag drafting vellum (30

sheets per student)
3 mil polyester film (15 sheets per student)
Ammonia developing print paper (45 sheets per student)

Teaching Aids.....Overhead projector
16mm film projector
35mm slide projector
Portable flip chart and markers

PRACTICAL APPLICATION ACTIVITIES

1. Select a course in your occupational area and prepare a complete course outline for it.

2. Distribute copies of your finished product to several fellow instructors and ask for their criticism. Review their comments and revise your outline in keeping with valid suggestions.

SELF-TEST FOR UNIT 2

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portion of the text covering any material you miss and do not proceed to the next module until you can correctly answer all items on the self-test.

1. What two items of information are included in the statement of purpose for a course?

2. Compile several topics to be covered in your occupational area and state them as course goals.

SELF-TEST FOR UNIT 2
Continued

3. What is an instructional delivery system?

4. What is an evaluation methodology?

5. What four items of information should the grading system statement include?

APPENDIX A

Sample Course Outline

Statement of Purpose

Computer Aided Drafting is the last of 10 courses leading to an occupational certificate in drafting and design. The purpose of this course is to help students develop all of the fundamental knowledge, skills and attitudes required to be job entry-level qualified as computer aided drafting technician trainees.

Course Goals

Upon completion of this course, students will be able to do the following:

1. Define the term "computer aided drafting."
2. List the components in a typical computer aided drafting hardware configuration.
3. Explain the basic operations of computer aided drafting: input, processing and output.
4. Demonstrate proficiency in the use of Cartesian coordinate systems.
5. Explain special characteristics of computer aided drafting including: accuracy, repeatability, resolution, speed and storage.
6. Explain the various types of hardware, software and users associated with computer aided drafting.
7. Demonstrate proficiency in performing computer aided drafting tasks including: digitizing, menu use, keyboard use, plotting, printing, editing, hardcopying, lettering, linework, scaling, dimensioning, rotating, zooming, mirroring and lavering.

Instructional Delivery System

The preparation-lecture-demonstration-application-evaluation instructional delivery system is recommended for this course. To begin each lesson, students should be required to read pertinent literature in their textbooks and from the library. The instructor then presents a heavily illustrated lecture explaining and reinforcing the reading material. Lectures are followed by skills development demonstrations when appropriate and then students are assigned application activities. These are followed by evaluations that include both written tests and proficiency exams.

APPENDIX

Sample Course Outline

Evaluation System

Objective written tests and proficiency examinations are the recommended evaluation methods for this course. Principles, theories, concepts and terminology are tested using objective written instruments at least once each week. Proficiency examinations requiring students to apply theories, concepts, principles, terminology and skills should be administered at least once every two weeks.

Grading Systems

Written tests are scored by forming a ratio of correct responses to possible correct responses (for example, a student who correctly answers 75 out of 100 questions would score 75/100 = .75 or 75%).

Proficiency exams are scored by listing performance criteria and scoring student performance against each criteria from 1 (low) to 5 (high). The student's total score divided by the total possible score is the final score (for example, a student whose total for all criteria is 50 when the total possible score is 75, would score 50/75 = .666 or 67% rounded off).

The following grade scale is to be used for converting numerical scores to letter grades:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

Final grades are to be computed according to the following percentages:

Average test scores	40%
Average of all proficiency exams scores	40%
Attendance score	10%
Student attitude, work habits, personability, willingness to learn, attention to safety rules and stick-to-itiveness	10%
	100%

Sample Course Outline
Continued

Resource List

Required Textbooks

1. Introduction to Computer Aided Drafting, by David L. Goetsch, Prentice-Hall Publishers, Inc., 1983.

2. The CAD/CAM Workbook, by David L. Goetsch, South-Western Publishers, Inc., 1983.

Recommended References

Any dictionary of computer terminology.

Tools and Supplies

Ink, extra pens, drafting vellum, polyester film and bond paper for the CAD system plotters.

Teaching Aids

Overhead transparency projector and screen.
35mm slide projector.

APPENDIX B

Key to Unit 1 Self-Test

1. Curriculum--All of the planned experiences offered students under the direction of the school.

   School curriculum--The sum of all the planned experiences offered under the direction of all the school's various vocational programs.

APPENDIX B

Key to Unit 1 Self-Test
Continued

Program curriculum--All of the planned experiences provided students under the specific direction of an individual vocational program.

Course--A plan for one well defined part of a program curriculum which is designed to facilitate the accomplishment of a particular set of learning goals.

Course outline--A master plan, or "blueprint," for presenting a course.

2. A course outline contains: a statement of purpose, a set of course goals, an instructional delivery system statement, an evaluation statement, a grading system statement and a resource list.

3. A course goal is written in a form that explains what the student will learn, rather than just what will be covered. The difference is that simply covering material is not enough. Students must learn what is covered.

APPENDIX C

Key to Unit 2 Self-Test

1. The overall purpose of the course and where it fits into the program curriculum.

2. Two examples are:

   Topic to be covered: Arrangement of keys on a typewriter keyboard.

   Corresponding learning goal: Students will learn to identify specific keys on an unmarked typewriter keyboard.

   Topic to be covered--Family Budgeting.

   Corresponding learning goal--Students will learn to develop and maintain a monthly family budget for a specified number of people based on a specific annual income.

APPENDIX C

Key to Unit 2 Self-Test
Continued

3. A compilation of all the methods instructors use to present instruction and facilitate learning.

4. A compilation of all of the methods instructors use to measure learning, development and progress in vocational education.

5. An explanation of how written tests are scored.
   An explanation of how skills projects or proficiency examinations are scored.
   An explanation of how numerical scores are converted to letter grades.
   A percentage breakdown for computing final grades.

LEARNING HOW TO TEACH

Lesson Planning

UNIT 1

An Overview of Lesson Planning

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop an overall understanding of lesson planning as a concept. Topics covered include: a definition of lesson planning, lesson plan formats, instructor vs. student lesson plans and the steps in lesson planning.

OBJECTIVES

Upon completion of this unit, you will be able to:

1. Define the term "lesson plan."
2. Explain why lesson plans are necessary for successful teaching and learning.
3. Explain the differences between instructor and student lesson plans.
4. List the various components of the format for a typical lesson plan.
5. Explain the steps in planning a lesson.

PRESENTATION OF MATERIAL

What is a lesson plan?

A lesson plan is the same thing to a teacher that a roadmap is to a traveler. It shows in detail where you are going and how you will get there. Teachers who teach without first planning their lessons are like travelers who venture out without a map, get lost and then drive in circles trying to find their way.

A vocational school's curriculum is divided into various vocational programs such as welding, drafting, secretarial science, auto mechanics and electronics. These programs are divided into courses and the courses are divided into lessons. The lesson is the basic unit for teaching purposes. Teachers teach lessons, but before lessons can be taught, they must be planned.

Planning a lesson consists of several steps: (1) determining where it fits into the overall course; (2) deciding what the instructional objectives of the lesson will be; (3) deciding how the lesson will be presented; (4) deciding what tools, supplies and instructional aids will be required; (5) deciding what assignments will accompany the lesson; (6) deciding how student learning will be tested and grades assigned; and (7) bringing all of this information together in the form of a lesson plan. The lesson plan itself is an organized, annotated outline containing all of the information listed above.

In presenting courses, you need to make sure that your material is well organized, consistent, built on past learning and sequenced from the simple to the complex. Lesson plans are the tools for meeting these criteria.

You can prepare lesson plans from either the instructor's point of view or the student's point of view. Some teachers prefer one method, some the other, and some use both. The primary difference is that an instructor lesson plan is written in terms that guide the actions of the instructor while a student lesson plan is written in terms that guide the actions of the student.

Lesson plan formats

A number of different formats exist for lesson plans that can be used with positive results. Which format is best depends on your needs. The following is a format that many vocational educators use and it is recommended here as a starting point for you.

1. Lesson number and title
2. Statement of purpose
3. Objectives of the lesson
4. Materials required for the lesson
5. Presentation and assignment information
6. Evaluation and grading information

What are the steps in lesson planning?

Lesson planning is a systematic process that must proceed in a step-by-step manner. You need to know all of the steps and to follow them in the proper order. The basic steps in lesson planning are:

1. Divide the course into lessons in a logical sequence beginning with the easier material and proceeding to the more difficult.
2. Give each lesson a number and name. From this point on, each lesson is planned individually.
3. Write a statement of purpose of the lesson.
4. Develop the objectives for the lesson.
5. Decide what support materials will be required (tools, supplies, equipment and instructional aids).
6. Decide how the lesson will be presented and what assignments will be given.
7. Decide how student learning will be evaluated and how grades will be assigned.

These are general steps that are used in developing both instructor and student lesson plans. Each step will be explained in greater detail as it applies to the two types of lesson plans in Units 2 and 3.

Do not be surprised to find that many experienced instructors do not use lesson plans. This is only natural. People who have taught a lesson several times no longer have to depend on lesson plans, just as people who travel the same route several times no longer have to depend on a roadmap. For the beginning instructor, however, lesson plans are essential and even experienced instructors should have them on file for occasional reference and updating.

PRACTICAL APPLICATION ACTIVITIES

1. Find an instructor on the faculty of the school where you teach who has lesson plans. Secure a copy of one of his or her lesson plans and examine it closely. Ask yourself these questions about the lesson plan:

   a. Is it written for an instructor or for students?

   b. What components does it contain? Could it be improved by adding any others?

   c. What are its similarities and differences when compared with the typical lesson plans format set forth in Unit 1?

2. Select a city in another state and make a list of all the preparation you would make in anticipation of a week long vacation to that city. Now compare the travel plan with a typical lesson plan. How are they similar? How do they differ?

3. Make a list of problems that might occur if you attempted to take a trip to a city you have never visited without planning the trip beforehand. Now make a list of the problems which might occur if you attempt to teach a lesson without planning it. Compare the lists.

SELF-TEST FOR UNIT 1

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the material covering any material you miss and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. Define the term "lesson plan."

2. Why is it important for you to plan lessons?

3. Explain the differences between student and instructor lesson plans.

SELF-TEST FOR UNIT 1
Continued

4. A typical lesson plan contains at least six components. List them in the proper order:

5. Give a brief description of the steps involved in planning a lesson.

6. Explain why some experienced instructors are able to teach without lesson plans.

UNIT 2

Developing Instructor Lesson Plans

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop skills in preparing instructor lesson plans. Topics covered include: developing the statement of purpose, developing the instructional objectives, selecting an appropriate delivery system, developing a list of supplies, tools and instructional aids, selecting appropriate learning activities and planning the evaluation and grading methodology.

OBJECTIVES

Upon completion of this unit, you will be able to:

1. Write a statement of purpose for an instructor lesson plan.
2. Develop the instructional objectives for an instructor lesson plan.
3. Select an appropriate delivery system for presenting a lesson.
4. Develop a list of supplies, tools and instructional aids required in presenting a lesson.
5. Select appropriate learning activities for a given lesson.
6. Plan a method of evaluating learning and assigning grades for a given lesson.
7. Compile all of the information from objectives 1-6 and convert it into a completed lesson plan.

PRESENTATION OF MATERIAL

Developing the statement of purpose

The first component in an instructor lesson plan, after the title and number, is the statement of purpose. This statement explains how a particular lesson fits into the overall sequence of lessons that make up a course, the main purpose of the lesson, and the major topics covered in the lesson. A well written statement of purpose is succinct and requires no more than a paragraph. Examine the following sample statement of purpose:

> This lesson is the second of 15 lessons that make up the course. The purpose of this lesson is to help students become proficient in the use of freehand lettering. Topics covered include: what is freehand lettering; how is it used and why is it important; selecting the proper leads; using the lettering guide; and forming/spacing of letters.

Developing the instructional objectives

The final component of the statement of purpose is a listing of the main topics covered in the lesson. The next step is to convert each topic into one or more instructional objectives. An instructional objective is a statement that summarizes what the students are supposed to learn about each topic.

Instructional objectives may be written in general terms or in very specific behavioral terms. In the case of instructor lesson plans, the generally stated form is more common. Behavioral objectives are used in student lesson plans (see Unit 3).

Examine the following instructional objectives, which were written in general terms. They were developed from some of the main topics listed in the sample statement of purpose above. Notice how the objectives relate to the topic:

Topic	
What is freehand lettering, how is it used and why is it important?	

Objectives

1. Students learn the definition of freehand lettering.
2. Students learn 10 ways in which freehand lettering is used.
3. Students learn to explain the importance of freehand lettering.

Topic

Selecting the proper leads.

Objectives

1. Students learn the various grades of lead used in drafting.
2. Students learn to classify leads as soft, medium and hard.
3. Students learn to select the proper lead for making guidelines, letters, numbers, notes and titles.

Selecting an appropriate delivery system

Once the learning objectives for a lesson have been developed, the instructor must decide how to best present the lesson to accomplish the objectives. The method of presenting the lesson is called the instructional "delivery system." The delivery system might be lecture/discussion, demonstration, question/answer or any other accepted teaching method. Vocational teachers tend to use the lecture/discussion method most frequently.

For the objectives shown above, the instructor might use the lecture/discussion method for presenting the theory, concepts and background knowledge about selecting the proper leads for freehand lettering. For actually showing students how to letter, the instructor would use the demonstration method.

Listing tools, supplies and instructional aids

In vocational classes, most lessons require tools, supplies and instructional aids. A list of the necessary materials is included on the lesson plan so that you can take inventory before beginning a lesson to ensure that all necessary materials are available and in working order. You should never have to stop a lesson in progress because an instructional aid does not work or because you have run out of a supply item.

The list of materials required for the sample lesson being developed in this unit follows:

1. Handout titled "Engineering Lettering."
2. Drafting paper and tape.
3. Two mechanical pencils.
4. Sample leads: 3H, 2H, H, F and HB.
5. Lettering guide.

Selecting learning activities

Students learn best by doing. Therefore, it is important for you not only to present the material for a lesson, but also to follow your instruction with application assignments that students complete. This will reinforce or expand their learning.

The following learning activities would be used with the sample lesson plan being developed for this unit:

1. Distribute the handout titled "Engineering Lettering."
2. Present a lecture/discussion session on lettering.
3. Present a demonstration on lettering.
4. Have students complete a full-page lettering activity using letters, words, sentences and numbers.

Selecting an evaluation and grading method

Three types of evaluation methods are commonly used in vocational classes: objective, subjective and performance evaluations. Objective evaluations are used to test a student's ability to recall or recognize information. They consist of true-false, multiple-choice, matching and short answer test items. Subjective evaluations are used to test a student's understanding of theories, concepts and principles and consist of essay type test items. Performance evaluations are used to test a student's ability to apply all appropriate learning in performing certain tasks.

In the sample lesson plan for this unit, the instructor would use an objective evaluation to determine if students had learned the information presented in the handout and the lecture/discussion session. A performance evaluation would be used to test the students' lettering skills.

When giving tests, it is important to ensure that the test measures the learning described in the instructional objectives for the lesson and to set expected performance levels that can be converted to letter grades for easy interpretation. In the sample lesson for this unit, the

instructor decides to grade the objective test and the performance test on a 0 - 100 scale and uses the following guidelines for assigning grades:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

The completed sample lesson plan for this unit is Appendix A of this module. Turn to it now and examine the completed lesson plan before proceeding to the practical application activities and self-test.

PRACTICAL APPLICATION ACTIVITIES

1. Using Appendix A as an example, develop a complete lesson plan for a lesson that deals only with knowledge, theories and principles.

2. Using Appendix A as an example, develop a complete lesson plan for a lesson that deals only with skills development.

3. Using Appendix A as an example, develop a complete lesson plan for a lesson that deals with both knowledge and skills.

4. Give your completed plans to your department chair or an experienced instructor and ask for a critique.

SELF-TEST FOR UNIT 2

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the key in the Appendix. Reread the material covering any questions that you miss and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. What are the three components of a well written statement of purpose?

2. Explain when you would use instructional objectives written in general terms and when you would use instructional objectives written in specific behavioral terms.

3. What is an instructional delivery system?

SELF-TEST FOR UNIT 2
Continued

4. Why is it important to list tools, equipment, supplies and instructional aids in a lesson plan?

5. Why is it important to follow up instruction with learning activities?

6. What are the three most commonly used types of evaluation in vocational classes?

UNIT 3

Developing Student Lesson Plans

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop skills in preparing lesson plans from the student's point of view. Topics covered include: advantages of student lesson plans; stating the purpose of the lesson, converting instructional objectives to behavioral objectives; listing assignments; listing supplies, tools, etc.; and explaining the evaluation/grading methodology.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Write a statement of purpose for a student lesson plan.
2. Develop behavioral objectives for a student lesson plan.
3. List assignments for a student lesson plan.
4. List supplies, tools, etc., for a student lesson plan.
5. Explain the evaluation/grading methodology for a student lesson plan.

PRESENTATION OF MATERIAL

Advantages of student lesson plans

Student lesson plans are written as if the instructor is talking to students. They guide the student's action. The instructor bases his or her actions on what the student is supposed to be doing, learning, etc. Because they guide the student's actions rather than the instructor's, they must be more specifically stated and more detailed than an instructor lesson plan.

Student lesson plans have several advantages over instructor lesson plans:

1. They can be used by both students and instructors.

2. They can be collected and given to the students as a comprehensive course outline at the beginning of the course.

3. If put together as a course outline, they allow the instructor to use a self-paced, competency-based delivery system , which is essential in some vocational programs.

Stating the purpose of the lesson

This component of the student lesson plans is similar to its counterpart in the instructor lesson plan, except that it is written from the student's perspective. It explains to students how the lesson in question fits into the overall course, why they are studying that particular lesson and the main topics covered. The following is a sample statement of purpose for a student lesson plan:

> This lesson is the second in a sequence of 15 lessons that you must complete in order to satisfy the requirements of the course. The purpose of this lesson is to help you become proficient in the use of freehand lettering. Topics covered in this lesson include: What is freehand lettering, how is it used and why is it important?; selecting the proper leads; using the lettering guide; forming individual letters; and spacing letters a d words.

Developing behavioral objectives

In Unit 2, you learned to develop instructional objectives. They were stated in general terms to give instructors an outline of what is to be taught for a given lesson. Behavioral objectives focus not on what is to be taught, but rather on what is to be learned. And they state very

specifically how the student's behavior will indicate mastery of the learning. Behavioral objectives must be stated in terms that allow student behavior to be observed or easily tested.

A complete behavioral objective has three components: the condition, the action and the performance criterion. The first component describes the conditions under which the student behavior will be performed. The second component defines the actual behavior. The third component establishes the expected level of performance. Following is an example of a behavioral objective dealing with knowledge:

> Upon completion of this lesson, the student will be able to list 10 different drafting fields with 80% accuracy.

Upon examination, the behavioral objective above breaks down into its component parts as follows:

> The condition - Upon completion of this lesson
>
> The action - List 10 different drafting fields
>
> The performance criterion - 80% accuracy

The key to writing good behavioral objectives is to use action verbs that define observable behavior. Vague, non-action verbs such as "understand" and "appreciate" should be avoided. You cannot see or easily measure understanding or appreciation. The following examples of behavioral objectives were developed from two of the topics in the sample statement of purpose:

> Upon completion of the lesson you will be able to:
>
> 1. Write the definition of freehand lettering with 100% accuracy.
> 2. List the nine grades of lead commonly used in drafting with 76% accuracy.

Listing assignments

The listing of assignments on a student lesson plan should include everything students are required to do to complete the lesson. The following list is an example that could be used for the sample lesson plan being developed for this unit:

> 1. Receive handout titled "Engineering Lettering" and read it carefully.
> 2. Participate in a lecture/discussion session on freehand lettering.

3. Observe a demonstration on using the lettering guide, forming letters and numbers and spacing letters and words.

4. Complete a full-page lettering activity on "A" size paper. See the sample lesson on the bulletin board.

Listing tools and supplies

The list of tools and supplies on a student lesson plan should include everything the students will need in order to complete the lesson. The following is a complete list for the sample lesson plan:

1. "A" size drafting paper.

2. Drafting tape.

3. Two mechanical pencils: one with a hard lead and one with a medium lead.

4. Lettering guide.

Explaining testing and grading

This final section should explain exactly how students will be tested and what scoring method will be used for assigning grades. The following explanation could be used for the sample lesson plan:

Upon completion of this lesson you will be tested and graded as follows:

1. An objective test covering the knowledge, theories and concepts presented in the handout titled "Engineering Lettering," in the lecture/discussion session and in the demonstration. The test will be scored on a 0 - 100 scale. You must score 76% or higher before proceeding to the performance exam.

2. A performance exam in which you will complete a lettering activity. It will require you to form letters, numbers, words and sentences. The exam will be scored on a 0 - 100 scale. You must score 76% or higher before proceeding to the next lesson.

3. The following grade scale will be used for converting numerical scores achieved on the tests into letter grades:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

The completed lesson plan for this unit is Appendix B of this module. Turn to Appendix B and examine the completed lesson plan before proceeding.

PRACTICAL APPLICATION ACTIVITIES

1. Convert the lesson plan developed in "Practical Application Activity" No. 1 of Unit 2 into a student lesson plan.

2. Convert the lesson plan developed in "Practical Application Activity" No. 2 of Unit 2 into a student lesson plan.

3. Convert the lesson plan developed in "Practical Application Activity" No. 3 of Unit 2 into a student lesson plan.

SELF-TEST FOR UNIT 3

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the key in the Appendix. Reread the material covering any questions that you miss and do not proceed to the next module until you can correctly answer all items on the self-test.

1. List three advantages of the student lesson plan over the instructor lesson plan.

2. Explain how the statement of purpose for a student lesson plan differs from that used for an instructor lesson plan.

3. What are the three components of a behavioral objective?

SELF-TEST FOR UNIT 3
Continued

4. List three vague verbs to avoid when writing behavioral objectives.

5. Convert the following instructional objective into a behavioral objective: Students will learn the definition of the term "orthographic projection."

APPENDIX A

Sample Instructor Lesson Plan

DRAFTING FUNDAMENTALS
Lesson 2 - Freehand Lettering

Statement of purpose

This lesson is the second in a sequence of 15 that make up the course. The purpose of this lesson is to help students become proficient in the use of freehand lettering. Topics covered include: what is freehand lettering, how is it used and why is it important?; selecting the proper leads, using the lettering guide; forming individual letters; and spacing between letters and words.

Instructional objectives

1. Students learn to define freehand lettering.
2. Students learn 10 ways freehand lettering is used.
3. Students learn the various grades of lead used in drafting.
4. Students learn to classify leads as soft, medium and hard.
5. Students learn to select the proper leads for freehand lettering.
6. Students learn to use the lettering guide.
7. Students learn to properly form all letters and numbers.
8. Students learn proper spacing between letters and between words.

Delivery system

1. Distribute handout titled "Engineering Lettering."
2. Present a lecture/discussion session on lettering.
3. Present a demonstration on how to use the lettering guide, how to form letters and how to space letters and words.

4. Have students complete a full-page lettering activity.

Support materials

1. Handout titled "Engineering Lettering."
2. Drafting paper and tape.
3. Two mechanical pencils.
4. Sample leads: 3H, 2H, H, F and HB.
5. Lettering guide.

Learning activities

1. Students read handout titled "Engineering Lettering."
2. Students participate in lecture/discussion session.
3. Students view lettering demonstration.
4. Students complete a full-page lettering activity.

Evaluation and Grading

1. Objective test developed from the handout, lecture/discussion material and demonstration outline, scored on a 0 - 100 scale.
2. Performance test in which students letter the alphabet, all numbers and several sentences, scored on a 0 - 100 scale.
3. Numerical scores are converted into letter grades using the following scale:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

APPENDIX B

Sample Student Lesson Plan

DRAFTING FUNDAMENTALS
Lesson 2 - Freehand Lettering

Statement of purpose

This lesson is the second in a sequence of 15 that you must complete in order to satisfy the requirements of the course. The purpose of this lesson is to help you become proficient in the use of freehand lettering. Topics covered in this lesson include: what is freehand lettering, how is it used and why is it important?; selecting the proper leads; using the lettering guide; forming individual letters; and spacing between letters and words.

Behavioral Objectives

Upon completion of this lesson you will be able to:

1. State orally or in writing the definition of freehand lettering with 100% accuracy.

2. List 10 ways freehand lettering is used with 76% accuracy or better.

3. List the nine grades of lead commonly used in drafting with 76% accuracy or better.

4. Classify the nine grades of lead used in drafting as being hard, medium or soft with 76% accuracy or better.

5. Select, with 100% accuracy, the proper leads for making guidelines, forming letters and forming numbers.

6. Demonstrate with 100% accuracy how to use a lettering guide for making the following guidelines: one-eighth, three-sixteenths, one-fourth and five-sixteenths.

7. Demonstrate how to properly form all letters of the alphabet with 100% accuracy.

8. Demonstrate how to properly form all numbers from 0 - 9 with 100% accuracy.

9. Demonstrate how to properly space between letters with 100% accuracy.

10. Demonstrate how to properly space between words with 100% accuracy.

Assignments

1. Receive handout titled "Engineering Lettering" and read it carefully.

2. Participate in a lecture/discussion session on freehand lettering.

3. Observe a demonstration on using the letter guide, forming letters and numbers and spacing letters and words.

4. Complete a full-page lettering activity (see sample on bulletin board).

Material

You will need the following materials in order to complete this lesson:

1. "A" size drafting paper

2. Drafting tape

3. Two mechanical pencils: one with a hard lead and one with a medium lead

4. Lettering guide

Testing and grading

Upon completion of your fourth assignment for this lesson you will be tested and grades will be assigned as explained below:

1. An objective test covering the knowledge, theories and concepts presented in the handout, lecture/discussion session and demonstration. The test will be scored on a 0 - 100 scale. You must score 76% or higher before proceeding to the performance examination.

2. A performance examination in which you will complete a lettering activity. It will require you to form letters, numbers, words and sentences. The test will be scored on a 0 - 100 scale. You must score 76% or higher before proceeding to Lesson 3.

APPENDIX

3. Numerical scores on both tests will be converted to letter grades using the following scale:

95 - 100	A
88 - 94	B
76 - 87	C
70 - 75	D
0 - 69	F

APPENDIX C

Key to Unit 1 Self-Test

1. A teacher's "roadmap" for a particular lesson. It contains a summary of all information the teacher needs to present a lesson.

2. To ensure that lessons are well organized, consistent, built on past learning and sequenced from the simple to the complex.

3. Instructor lesson plans are written in terms of the instructor's behavior. Student lesson plans are written in terms of the student's behavior.

4. a. Lesson number and title
   b. Statement of purpose
   c. Objectives of the lesson
   d. Materials required for the lesson
   e. Presentation/assignment information
   f. Evaluation/grading information

5. a. Divide entire course into lessons in a logical sequence
   b. Give each lesson a number and name
   c. Write a statement of purpose for the lesson in question
   d. Develop objectives for the lesson
   e. List the necessary support materials
   f. Decide how the lesson will be presented and what assignments will be given
   g. Decide how students will be evaluated and grades assigned

6. They have taught their lessons so many times that they know the lessons by memory.

APPENDIX D

Key to Unit 2 Self-Test

1. a. Where lesson fits into sequence.
   b. Purpose of the lesson.
   c. Major topics covered.

2. Instructional objectives written in general terms are used in lesson plans intended for use by the instructor. Objectives written in specific behavioral terms are used for student lesson plans.

3. The methods used for planning a lesson.

4. To ensure that all necessary support materials are available and in working order.

5. Because students learn best by doing. Learning activities reinforce their learning.

6. Objective, subjective and performance.

APPENDIX E

Key to Unit 3 Self-Test

1. a. They can be used by both students and instructors.
   b. They can be put together and used as comprehensive course outlines.
   c. They allow for a self-paced, competency-based delivery system.

2. It is written from the student's perspective.

3. a. The condition.
   b. The action.
   c. The performance criterion.

4. Know, appreciate, understand, comprehend, realize, etc.

5. Upon completion of this lesson, the student will be able to state the definition of "orthographic projection" with 100% accuracy.

LEARNING HOW TO TEACH

Testing and Evaluation

UNIT 1

An Overview of Testing and Evaluation

STATEMENT OF PURPOSE

The purpose of this unit is to help you develop an understanding of the concepts of testing and evaluation. Topics covered include: introduction to testing and evaluation, purpose of testing and characteristics of a good test.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Define the terms "evaluation" and "testing."
2. Explain four purposes of teacher-made tests.
3. Explain six characteristics of a good test.

PRESENTATION OF MATERIAL

Introduction to testing and evaluation

Evaluation is an important component in the four-step approach to teaching: preparation, presentation, application and evaluation. To vocational instructors, evaluation means the process whereby student progress toward accomplishing specified learning objectives is measured. Testing is the most frequently used, most popular method for conducting evaluations. Evaluation is the broad term used to describe the overall process and testing is the more specific term that describes how teachers go about collecting the data to be used in making evaluations.

AN OVERVIEW OF TESTING AND EVALUATION

A complete teacher-conducted evaluation of learning includes: administering tests, scoring tests and assigning marks.

Purposes of testing

Teacher-made tests serve four basic purposes: (1) to provide a basis for assigning marks; (2) to provide a mechanism for charting progress; (3) to assist instructors in improving their instruction; and (4) to serve as a learning experience for students.

Characteristics of a good test

In order to effectively serve the purpose outlined above, tests must be good tests. A good test must have six characteristics:

1. Validity

   A valid test is a test that measures what it was designed to measure. For example, students are given a test to determine if they have learned a list of vocabulary words for a particular lesson. The list of words is quite long, but students are allowed only 30 minutes to complete the test. Rather than simply testing the students' knowledge of vocabulary, the instructor is also testing how fast they can write their definitions. A student who writes slowly might not complete the test even though the student knows all of the definitions.

2. Reliability

   This means that a test consistently provides accurate results. A reliable test, given under similar conditions to a similar group of students, will consistently yield close to the same results.

3. Objectivity

   This means that a test must be fair. It should not favor any specific group that can be segregated according to sex, age, race, size or any other characteristic. Answers on the test should be easily viewed as correct or incorrect and not be subject to varying interpretation.

4. Discrimination

   This means that a test must separate students into groups according to their knowledge of the subject matter. Students who have a firm grasp of the subject matter should receive high scores, students with a moderate grasp of the subject

matter should receive medium range scores and students with a poor grasp of the subject matter should receive poor scores. As obvious as this sounds, many tests do not properly discriminate.

5. Comprehensiveness

This means that a test should be thorough enough to adequately measure a student's grasp of the subject matter. For example, if a test is covering 10 learning objectives and contains only one test item per objective, it will not be comprehensive enough to effectively do the job. Several test items per objective are necessary for a test to be comprehensive.

6. Scoreability

This means that a test should be easy to score. This is an important characteristic because immediate feedback is critical in evaluation. Test results should always get back to students before new learning is attempted.

PRACTICAL APPLICATION ACTIVITIES

1. Identify a vocational instructor who has a good testing program and then do the following:

   Discuss testing and evaluation as concepts with this instructor.

   Discuss the purpose of his or her tests.

2. Collect several tests from instructors in your occupational area. Take the tests yourself and ask the instructors to score them. Examine each test according to the six characteristics of a good test. How do they measure up?

SELF-TEST FOR UNIT 1

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portions of the text covering any material you miss, and do not proceed to the next unit until you can answer correctly all items on the self-test.

1. Define the term "evaluation."

2. Define the term "testing."

3. List four purposes of teacher-made tests.

4. List the six characteristics of a good test.

UNIT 2

Testing for Knowledge of Theories, Principles, Concepts and Terminology

STATEMENT OF PURPOSE

The purpose of this unit is to help you learn how to develop tests that evaluate a student's knowledge of theories, principles, concepts and terminology. Topics covered include: test construction, recall test items, multiple-choice test items, true-false test items, and matching test items.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Explain the basic steps in test construction.
2. Explain the proper utilization of recall, multiple-choice, true-false and matching test items.
3. Demonstrate proficiency in developing tests utilizing recall, multiple-choice, true-false and matching test items.

PRESENTATION OF MATERIAL

Test Construction

Test construction is a systematic process involving seven basic steps. Each step is important and must be undertaken in the proper order. The steps are:

TESTING FOR KNOWLEDGE OF THEORIES, PRINCIPLES, CONCEPTS AND TERMINOLOGY

1. Examine the test objectives.

   Vocational courses are divided into lessons and each lesson has a set of learning objectives. Testing is a way for you to measure student progress toward accomplishing these learning objectives. Therefore, the first step in preparing a test is to examine the learning objectives that the test will cover. They explain exactly what students should have learned during the lesson.

2. Construct several test items for each objective.

   The objectives delineate what is to be tested. Test items are how it will be tested. It is important to develop several test items for each learning objective to ensure that the completed test will be comprehensive.

3. Compile all test items into a draft of the completed test.

   All of the various types of items are grouped together. For example, all true-false are put together, all recall items together, all matching items together and so forth. The various groups of test items are then placed in an ordered sequence.

4. Write instructions for each group of test items.

   A separate set of instructions is required for each group of test items. True-false questions require a different type of response from matching questions. Do not presume that students automatically know how to respond to test questions. Clear, concise instructions that include a sample response are an important part of any test. Following is a sample of the type that would be used with true-false questions:

   Directions

   Each of the statements below is either true or false. Indicate which by writing the word TRUE or FALSE in the blank preceding each statement. Example:

   1. FALSE Five plus five equals 12.

5. Ask another person to examine the completed test.

   A second opinion is always a good idea. Another party can usually identify flaws that the test maker might overlook because of familiarity with the subject matter, intent of the instructions or other aspects of the test.

6. Make any necessary revisions and then prepare the final copy.

   Close scrutiny of a test by a second party will usually identify certain points that need to be clarified or could be simplified. When this is the case, the test draft should be revised accordingly. Once the revisions are made, the test can be finalized, typed, and copied.

7. Make a test key.

   The final step, and one which must not be overlooked, is to make a test key. The key is a copy of the test with the correct answers written in, which will allow you to score the test quickly and with ease. This is important if students are to receive immediate feedback as to the results.

Recall test items

Recall test items are sometimes referred to as "fill-in-the-blank" or short answer questions. "Recall" means that the questions are posed in such a way that test takers must totally recall the answers from memory. This is opposed to recognition questions, such as a matching and multiple-choice, in which test takers must only recognize the correct answer from among a group of possible responses. Recall test items are considered the more difficult.

Recall test items are particularly appropriate for use in situations requiring the retention of who, what, where and when types of information. The following questions are samples of recall test items:

1. The six grades of lead most frequently used in drafting are:

2. _____ lead is considered best for lettering.

3. There are three components in a computer aided drafting system. Hardware, software and _____.

4. Define the term "orthographic projection."

5. Explain the difference between isometric and oblique projection in as few words as possible

Multiple-choice test items

A multiple-choice test item consists of a question followed by a list of possible answers. Test takers read the question and then select an answer from among those listed. They need not totally recall the answer from memory, but rather need only recognize it from among the list of possibles. For this reason, multiple-choice test items are categorized as recognition items.

TESTING FOR KNOWLEDGE OF THEORIES, PRINCIPLES, CONCEPTS AND TERMINOLOGY

Multiple-choice items are particularly appropriate for questions involving definitions, principles, purposes, and causes and effect relationships. They offer several advantages over other types of questions. Multiple-choice tests are easy to take and easy to score. They decrease the guessing factor and their scoring is totally objective.

There are some precautions to observe when constructing multiple-choice test items: (1) make sure that the incorrect answers included in the list of possibles for each item are not obviously incorrect and (2) make sure that no more than one correct response is included in the list.

The following questions are samples of multiple-choice test items:

1. What is the long side of a right triangle called?

   a. Adjacent side
   b. Opposite side
   c. Hypotenuse side
   d. Tangent side

2. The key to the flexibility of a computer aided drafting system is:

   a. Software
   b. Hardware
   c. Firmware
   d. Users

3. Which of the following techniques IS NOT a system drafting technique?

   a. Ink drafting
   b. Drafting on polyester
   c. Pencil drafting on vellum
   d. Composite drafting

4. Drawing is to manual drafting what _____ is to computer aided drafting.

   a. Key stroking
   b. Manipulation
   c. Plotting
   d. Hardcopying

True-false test items

True-false test items are probably the most used and most abused type of test question. A true-false item consists of a statement that is either true or false. Students read the statement and decide whether it is correct or incorrect.

The most obvious weakness of the true-false item is that there are only two possible responses. Therefore, a significant guessing factor is built in. However, with careful construction, the true-false item can still be a legitimate test question.

True-false test items offer a number of advantages. They are easy to take and score. And they are particularly effective when dealing with situations that have only two alternatives. However, they also have a number of limitations. True-false items encourage guessing and guessing skews the test results, thus decreasing the validity and reliability of the test. In addition, it is difficult to construct true-false items that are completely true or completely false without being obviously so. It is also difficult to avoid being ambiguous in the wording of items.

There are several tips to keep in mind when constructing true-false test items: (1) make sure that there is no pattern to the answers; (2) make approximately half of the items true and half false; (3) make all items approximately the same length and (4) do not attempt to "trick" students with the wording of the question. The following questions are samples of true-false test items demonstrating four possible formats:

1.	TRUE FALSE	The architect's scale is used for making measurements in feet, inches and fractions.
2.	T F	The metric scale is used for measuring inches in decimal form.
3.	TRUE	The civil engineer's scale is used for measuring feet in decimal form.
4.	TRUE or FALSE	Printed circuit board drawings are frequently laid out at a scale of 2:1.

Matching test items

Matching test items require students to match one list of "question" items with another list of "answer" items. Like multiple-choice items, matching questions are recognition type items. Actually, matching is nothing more than a variation of the multiple-choice item.

Like recall items, matching questions are particularly effective for testing who, what when and where information, and they offer a number of advantages. They are easy to construct, take and score, and scoring is totally objective.

On the other hand, there are limitations to the matching type test item. They are not designed to measure understanding and they tend to emphasize memorization of facts and figures. They are also difficult to construct without building in context clues.

There are several tips to observe when constructing matching test items: (1) each item should have between five to 10 possible responses; (2) make sure the answer list has more possible responses than the question list requires; (3) do not put any obviously incorrect responses in the answer list and (4) place the question list on the left hand side of the page and the answer list either over it or to the right of it. The following are two examples of matching test items:

a. Digitizer	d. Plotter
b. CRT workstation	e. Printer
c. Processor	f. Hard copy unit

_____ The component in a computer aided drafting configuration that resembles a cross between a television and a typewriter.

_____ The component in a computer aided drafting configuration that actually constructs the drawings.

_____ The component in a computer aided drafting hardware configuration that converts graphic data into digital data.

_____ The component in a computer aided drafting configuration that outputs alphanumeric data.

QUESTIONS	RESPONSES
_____ 1. .001 metre	a. millimetre
_____ 2. 10 metres	b. centimetre
_____ 3. 1000 metres	c. decimetre
_____ 4. .01 metre	d. dekametre
	e. hectometre
	f. kilometre

PRACTICAL APPLICATION ACTIVITIES

1. Obtain a lesson plan for a lesson in your occupational area. Examine the learning objectives closely. Develop a test that will measure student knowledge of any principles, concepts, theories and terminology covered in the lesson. Develop at least three questions for each objective and make sure to include recall, multiple-choice, true-false and matching items.

2. Ask a colleague or advanced student to examine the test and critique it. Make any necessary revisions for clarification or simplification.

3. Construct a key for the test.

SELF-TEST FOR UNIT 2

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portions of the text covering any material you miss and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. List in order the seven basic steps in test construction.

2. What is meant by the term "recall?"

3. Recall test items are particularly effective in testing four types of information. What are they?

4. List three advantages of multiple-choice test items.

SELF-TEST FOR UNIT 2
Continued

5. What is the most obvious weakness with true-false test items?

6. Matching test items are particularly effective for testing four types of information. What are they?

7. Construct an example of a recall test item of the "fill-in-the-blank" type.

8. Construct an example of a multiple-choice test item.

9. Construct an example of a true-false test item.

10. Construct an example of a matching test item.

UNIT 3

Testing for Skills Development

STATEMENT OF PURPOSE

The purpose of this unit is to help you learn how to measure skills development. Topics covered include: measurement by daily observation, evaluating assigned projects and skills tests.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Explain how skills development can be measured through daily observation.
2. Explain how skills development can be measured by evaluating assigned projects.
3. Demonstrate proficiency in developing skills tests.

PRESENTATION OF MATERIALS

Measurement of skills by daily observation

In an English Literature class, it would be impossible for a teacher to walk around the room, watch the student reading and "see" if they understand the symbolism in a particular short story. In this particular situation, observation would be a questionable evaluation method. Understanding is not something one can see. However, when manipulative skills are the subject of evaluation, observation can be a very effective evaluation method.

Daily observation of skills development has several advantages as an evaluation technique: (1) it provides a continuous measure of progress that allows for frequent and immediate feedback; (2) it allows you to conduct evaluations during class without taking time away from normal day-to-day activities and (3) it allows you to correct improper applications of manipulative skills before students develop permanent bad habits.

You can do a number of things to ensure the effectiveness of evaluations by observation: (1) develop a list of specific behaviors and results you expect to observe; (2) keep daily written records of your observations; (3) relate your observations and corresponding expectations directly to the learning objectives of the lesson in question and (4) use a quantitative method for recording observations (for example, a scale of 1-5 for each observation of a given behavior or result).

The following items are samples of criteria a drafting instructor might use in making daily observations and recording the results:

Observation	Rating
1. Constructs lines of proper width.....	1 2 3 4 5
2. Constructs lines of proper darkness.....	1 2 3 4 5
3. Properly forms letters.....	1 2 3 4 5
4. Properly spaces words.....	1 2 3 4 5

Evaluating assigned skills projects

Another effective method for evaluating skills development in vocational courses is the assigned project. Once a student's skills have developed to a certain point, he or she can be given a project to complete in which the skills must be applied.

For example, an automotive student who should have developed the skills necessary to build a carburetor can be assigned the project of rebuilding a carburetor. A drafting student who is developing the skills required to construct a difficult orthographic projection can be assigned a drawing project requiring orthographic projection. You can then examine the completed project and make a determination as to the level of skills actually developed.

The saying that "the proof is in the pudding" applies in evaluating skills projects. This type of evaluation is particularly effective in putting your own experience to use.

Like evaluation by observation, evaluation of completed skills projects requires that a definite set of criteria be used. You should develop a list of specific criteria to be applied and develop a method for rating student performance in terms of each criterion. For example, the drafting teacher who will evaluate an orthographic projection project might use the following checklist:

Criteria	Points Possible	Points Earned
1. Correct solution	25	
2. Properly dimensioned	25	
3. Linework	10	
4. Lettering	10	
5. Arrowheads	10	
6. Neatness	10	
7. Reproductivity	10	
	100	

Comments

_____

_____

_____

_____

Skills tests

Another effective way to evaluate skills development is to use a skills test. A skills test is designed to measure a student's ability to perform selected manipulative tasks. It can be used to measure quality of work, speed of performance, adherence to proper procedures, or all three of these things.

Skills tests are particularly effective for: (1) measuring a student's performance under job-like conditions, (2) measuring the effectiveness of instruction for a given lesson and (3) measuring actual skills development in a given area.

TESTING FOR SKILLS DEVELOPMENT

Skills tests are not without problems. Not only are they time consuming, but they require you to plan other activities for students waiting to take the skills test, demand your close attention and require you to replicate job-site conditions.

You can overcome these drawbacks and improve the effectiveness of your skills test by following these steps:

1. Analyze the skill to be performed in detail. Make a list of major operations and a set of procedures that must be followed in completing each operation.

2. Make a list of the tools required to perform each operation.

3. Decide upon a tentative time frame for completion of the test.

4. Ask a fellow instructor to examine all aspects of your plan. Are all operations included? Are all procedures listed in the proper sequence? Are the instructions clear? Is the time realistic?

5. Make any necessary revisions.

6. Transform the plan into a skills test and develop a checklist for use in evaluating performance on the test.

Following is an example of a plan that was developed by a drafting instructor to be used in constructing a skills test to measure a students' skills at laying out a three view drawing.

Skills Test Plan

Operation	Procedures	Tools
1. Tape paper to drafting board.	a. Align paper with top edge of parallel bar. b. Tape corners of paper on top. c. Tape corners of paper on bottom.	a. Drafting paper. b. Drafting tape.
2. Compute the amount of drawing space available.	a. Measure length of paper. b. Measure width of paper.	a. Scale. b. Pencil.

Operation	Procedures	Tools
3. Compute drawing space required in length direction.	a. Determine length of front view. b. Determine width of right side view. c. Take sum of a + b.	a. Scale. b. Pencil. c. Eraser.
4. Compute drawing space required in width direction.	a. Determine height of front view. b. Determine width of top view. c. Take sum of a + b.	a. Scale. b. Pencil. c. Eraser.
5. Layout top, front and right side view "boxes."	a. Layout front view box. b. Layout top view box. c. Layout right side view box.	a. Scale. b. Pencil. c. Eraser.

Once the operations, procedures and tools have been outlined, the actual skills test instrument and evaluation checklist can be developed. The following skills test was developed from the skills test plan above:

Skills Test
Laying Out a Three View Drawing

Directions

This test is designed to measure your skill in laying out a three view drawing. In order to complete the test you will need the following materials: one sheet of "B" size drafting paper, one roll of drafting tape, one scale, one pencil and one eraser. Place these tools on your drafting board and then proceed as follows:

1. Fasten the drafting paper to your drafting board.

2. Layout the three view drawing provided by the instructor.

NOTE

You will be allowed five minutes to complete this activity.

The following evaluation checklist was developed for use in scoring the performance of students taking the skills test above:

Skills Test Evaluation Checklist

Student Name: _____

Beginning Time: _____

Ending Time: _____

Minutes Used: _____

Procedures	Points Possible	Points Earned
Operation 1 - Taping paper to drafting board.		
a. Align paper with top edge of parallel bar.....	10	_____
b. Tape corners of paper on top.....	10	_____
c. Tape corners of paper on bottom.....	10	_____
Operation 2 - Compute amount of drawing space available.		
a. Measure length of paper.....	10	_____
b. Measure width of paper.....	10	_____
Operation 3 - Compute drawing space in length		
a. Determine length of front view.....	10	_____
b. Determine width of right side view.....	10	_____
c. Take sum of a + b.....	10	_____
Operation 4 - Compute drawing space in width		
a. Determine height of front view.....	10	_____
b. Determine width of top view.....	10	_____
c. Take sum of a + b.....	10	_____

Operation 5 - Layout top, front and right side view boxes.

a.	Layout front view box.....	10	_____
b.	Layout top view box.....	10	_____
c.	Layout right side view box.....	10	_____

PRACTICAL APPLICATION ACTIVITIES

1. Develop an observation checklist for use in evaluating students in the performance of everyday skills activities in your occupational area. Show your checklist to an experienced vocational instructor and ask him or her to critique it. Discuss its use with this instructor.

2. Develop a criteria checklist and rating form for evaluating an assigned skills project in your occupational area. Show your instrument to an experienced instructor and ask him or her to critique it. Discuss its use with this instructor.

3. Develop a skills test for a specific skill in your occupational area. Go through all of the following steps:

   a. Develop a comprehensive skills test plan. Ask a fellow instructor to examine it for you. Make any necessary changes.

   b. Develop the actual skills test instrument.

   c. Develop an evaluation checklist to use in scoring the skills test.

SELF-TEST FOR UNIT 3

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portions of the text covering any material you miss and do not proceed to the next unit until you can correctly answer all items on the self-test.

1. List three advantages of daily observations as an evaluation technique.

2. List four things you can do to improve the effectiveness of evaluations by observation.

SELF-TEST FOR UNIT 3
Continued

3. How can vocational instructors ensure the effectiveness of evaluations of skill projects?

4. Define "skills test."

5. List three uses for which skills tests are particularly effective.

UNIT 4

Scoring and Grading

STATEMENT OF PURPOSE

The purpose of this unit is to help you learn how to score tests and how to convert scores into letter grades. Topics covered include: scoring written tests, scoring skills tests and projects and converting numerical scores into letter grades.

OBJECTIVES

Upon completion of this unit you will be able to:

1. Demonstrate a method for scoring written tests.
2. Demonstrate a method for scoring skills tests and projects.
3. Demonstrate a method for converting numerical scores into letter grades.

PRESENTATION OF MATERIAL

A score on a written test is a ratio of the total number of answers required to the number of correct answers given. In this definition, notice that answers, not questions, are the important element when scoring a test. This is because one question might require several answers. Written test scores can be easily expressed in terms of a percentage. For example, suppose a test requires a total of 80 answers. A student correctly responds to 60. His score would be 60/80 or 75%. The 75% score is arrived at by dividing 80 into 60.

SCORING AND GRADING

The following steps will help you to arrive at numerical scores on written tests:

1. Count the total number of answers required on the test.
2. Count the number of correct responses.
3. Divide the total number of answers required into the number of correct responses.
4. Record the score as a percentage.

Scoring skills tests and projects

A score on a skills test or project is a ratio of expected performance to actual performance. There are two frequently used, effective methods for scoring skills tests and projects: (1) a rating scale in which student performance is rated along a continuum from 1 to 5 or 1 to 10 (the higher the number, the better the performance) and (2) points possible weighed against points earned.

In both of these methods, the total score for the test or project is a ratio of total points possible and actual points earned. Consider the following rating scale which might be used in scoring a skills test:

Performance	Rating
1. Task number 1	1 2 **3** 4 5
2. Task number 2	1 2 3 **4** 5
3. Task number 3	1 2 **3** 4 5
4. Task number 4	1 2 **3** 4 5
5. Task number 5	1 2 3 **4** 5

In this example, a perfect score would have been 25 (5 tasks times a possible score of 5 on each task). The actual score is 17 (3 + 4 + 3 + 3 + 4). This can be converted into a percentage by dividing 17 by 25. The resulting score is 68%.

The next example is a checklist for evaluating a skills project. It makes use of the points possible versus points earned method of scoring.

Criteria	Points Possible	Points Earned
1. Criterion number 1.....	10	8
2. Criterion number 2.....	10	9
3. Criterion number 3.....	10	8
4. Criterion number 4.....	10	7
5. Criterion number 5.....	10	6
	50	38

In this example, a perfect score would have been 50. The actual score earned is 38. This can be converted into a percentage by dividing 38 by 50. The resulting score is 76%.

Converting numerical scores into letter grades

The methods of scoring presented above all result in a numerical score expressed as a percentage. This is very much like a player's batting average in baseball. However, vocational students usually want to see their performance expressed as a grade rather than a numerical percentage. Letter grades such as "A" through "F" or statements such as "satisfactory" or "unsatisfactory" are generally used for reporting student performance in vocational classes.

Numerical scores, therefore, are only the first step. They must be converted into letter grades or statements so that they can be easily interpreted by students. This is simple task which can be accomplished by using a grade scale.

A grade scale is a list of all scores from 0 - 100% grouped according to corresponding letter grades. The following grade scale is frequently used and has become the traditional grade scale in most educational institutions:

95 - 100%	A
88 - 94%	B
76 - 87%	C
69 - 75%	D
0 - 68%	F

The same scale may be used for assigning "satisfactory" and "unsatisfactory" marks. In this case, it is altered to read as follows:

76 - 100%	Satisfactory
0 - 75%	Unsatisfactory

Some schools adopt standard grade scales for converting numerical scores into letter grades. Others leave the scale used to the discretion of the individual instructor. If your school has a standard grade scale, use it. If not, the scale shown above will meet your needs.

PRACTICAL APPLICATION ACTIVITIES

1. Compute the test scores for the students listed below:

Student	Total Answers	Correct Answers	Score
A	100	90	____
B	90	67	____
C	60	37	____
D	75	74	____
E	88	80	____
F	17	15	____
G	150	132	____
H	94	82	____
I	58	54	____
J	49	37	____

2. Compute the student's score on the following skills test:

Performance	Rating
Task number 1.....	1 2 <u>3</u> 4 5
Task number 2.....	1 2 3 <u>4</u> 5
Task number 3.....	1 2 3 4 <u>5</u>

Score: _____

3. Compute the student's score from the following skills project checklist:

Criteria	Points Possible	Points Earned
Criterion 1.....	10	8
Criterion 2.....	10	7
Criterion 3.....	10	7

Score: _____

4. Convert the following test scores into letter grades using the grade scale provided.

95 - 100%	A
88 - 94%	B
76 - 87%	C
69 - 75%	D
0 - 68%	F

Score	Grade
87	_____
92	_____
51	_____
67	_____
88	_____
99	_____
100	_____
72	_____
85	_____
46	_____

SELF-TEST FOR UNIT 4

Directions

Respond to all questions without referring to the text of the unit. Once you have completed the self-test, check your answers by turning to the appropriate key in the appendices. Reread the portions of the text covering any material you miss until you can correctly answer all items on the self-test.

1. List the four steps that vocational instructors should follow in arriving at numerical scores for written tests.

2. Compute the following test scores (rounded to the nearest whole number). e following test scores (rounded to the nearest whole

Total Answers	Correct Answers	Score
53	47	_____
150	127	_____
68	62	_____
100	76	_____
175	171	_____

3. A student scores 47 out of a possible 50 points on a skills test. What is his/her numerical score?

4. Using the grade scale set forth in this unit, what is the letter grade that would be assigned the student in question 3?

APPENDIX A

Key to Unit 1 Self-Test

1. The process whereby students progress toward accomplishing specific learning objectives is measured.

2. Testing is a method used for conducting evaluations.

3. a. To provide a basis for assigning marks.
   b. To provide a mechanism for charting progress.
   c. To assist instructors in improving their instruction.
   d. To serve as a learning experience for students.

4. Validity, reliability, objectivity, discrimination, comprehensiveness, scoreability.

APPENDIX B

Key to Unit 2 Self-Test

1. a. Examine the lesson objectives.
   b. Construct several test items for each objective.
   c. Compile all test items into a draft of the completed test.
   d. Write instructions for each group of test items.
   e. Ask another person to examine the completed test.
   f. Make any necessary revisions and prepare final copy.
   g. Make a test key.

2. Students must remember the answer from memory with no clues.

3. What, when, where and who.

4. Three of the following:

   a. Easy to take.
   b. Easy to score.
   c. Cut down on the guessing factor.
   d. Scoring is totally objective.

5. Only two possible alternatives increases the guessing factor.

6. What, when, where and who.

7 - 10. Refer to the text of Unit 2 for examples of the various types of test items.

APPENDIX C

Key to Unit 3 Self-Test

1. a. Provides a continuous measure of progress that allows for frequent and immediate feedback.

   b. Allows instructor to conduct evaluations during class without taking time away from normal day-to-day activities.

   c. Allows instructor to correct improper application of skills before bad habits form.

2. a. Develop a list of specific behaviors and results that you expect to observe.

   b. Keep daily written records of observations.

   c. Relate observations directly to learning objectives.

   d. Use a quantitative method of recording observations.

3. Develop a list of specific criteria to be applied and a method for rating student performance in terms of each criterion.

4. A test designed to measure a student's skill at performing selected manipulative tasks.

5. a. Evaluating quality of work.
   b. Measuring speed of performance.
   c. Evaluating adherence to proper procedures.

APPENDIX D

Key to Unit 4 Self-Test

1. a. Count the total number of answers required on the test.
   b. Count the number of correct responses.
   c. Divide the total number of answers required into the number of correct responses.
   d. Record the scores as a percentage.

2. 87, 85, 91, 76, 98

3. 94

4. B